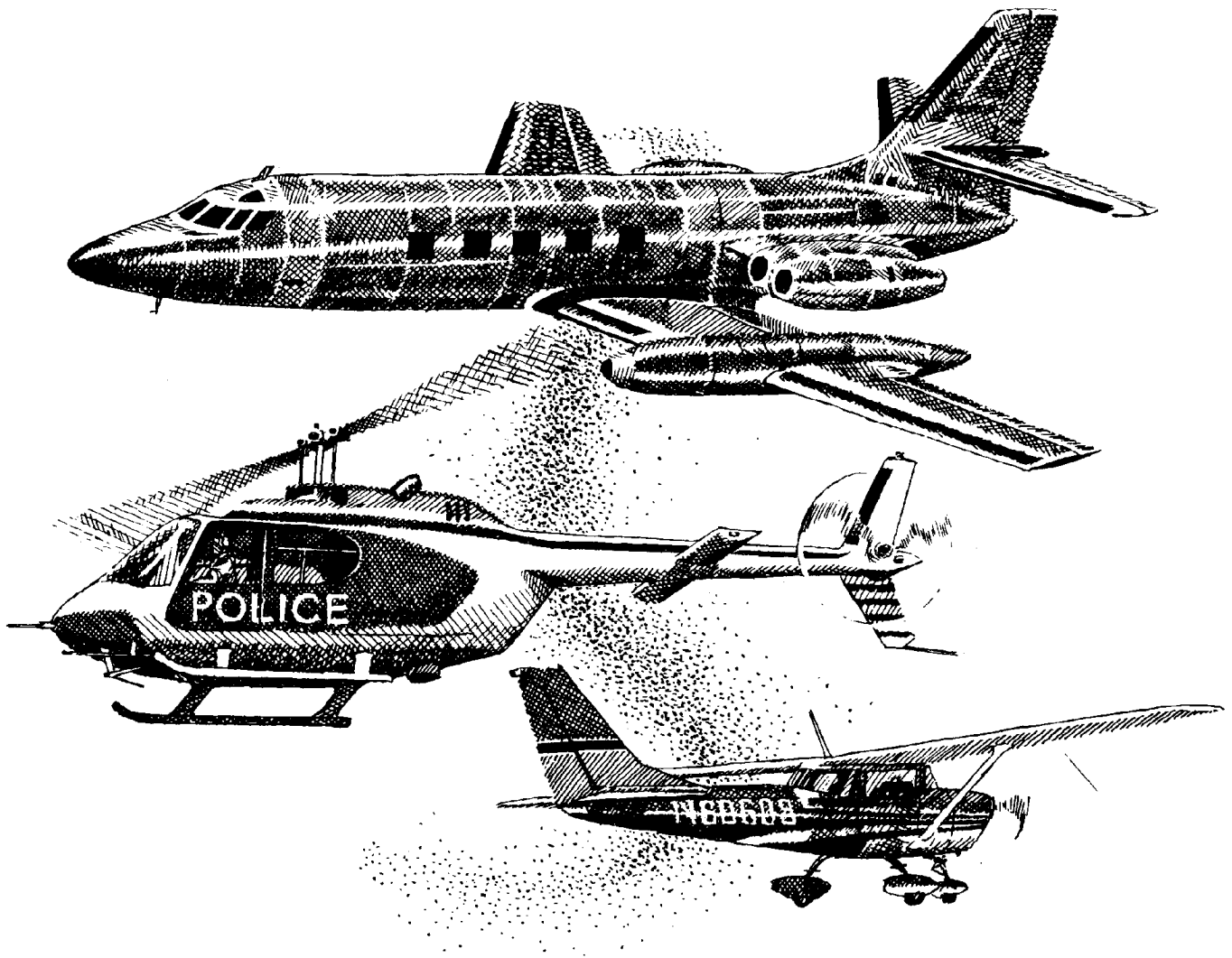


# A HISTORY OF GENERAL AVIATION



# GENERAL AVIATION LEARNING PACKET



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# INTRODUCTION

This learning packet contains information about general aviation in the United States. The packet was developed to help students, faculty, and the general public understand what general aviation is and the critical role it plays in our lives.

We want this packet to point out certain facts that will develop an understanding of general aviation and erase misconceptions. Many people still think that flying a small airplane is more dangerous than driving an automobile. This is not true. Others believe that small aircraft are a hazard to the safe flight of airliners and that the small aircraft should be restricted to certain airspace away from airways and airports used by larger aircraft, if not banned from flying altogether. This, too, is not true.

Understanding any subject requires a knowledge of the terminology and structure associated with the subject. A background of the subject's origin and subsequent development is also required. This packet on general aviation provides information in narrative form, and students will experience reinforcement of their knowledge as they complete the various task cards and study the accompanying visual displays.

We have compiled this packet on general aviation to include posters (artwork) and task cards. The posters, when used as a visual display, will serve well in capturing the students' attention and will provide information and motivation as they complete the task cards.

The General Aviation Learning Packet is made up of a recommended teaching method, a short text that covers the development and time segments of general aviation, a materials list, suggestions for evaluating student activities, a test with a test key, a student record sheet, task cards, 16 sheets of poster art, and a certificate of achievement.

The recommended teaching method is a list of steps you can take to guide your students down the path toward successful completion of the entire learning packet. It is only one route. You, of course, may diverge from the path in any way you see fit and use your academic discretion in any way you want to arrive at the desired learning outcome.

The text contains information that will help the students identify and distinguish between the classifications and categories of aviation, understand the adaptability of aircraft, and relate events in general aviation development to certain periods of U.S. history.

The materials list tells you what is required to complete each of the 24 tasks. This list is provided in the event you wish to locate all the materials in one place.

Next is a list of suggestions that you may find useful in evaluating the work done by your students as they progress through the tasks.

This is followed by a test and the test key. If you wish, you may use this evaluation tool as a pretest before the students begin work on their first task. After all tasks have been finished, it may be used again as a posttest to identify gained knowledge. If you use the test, a block is provided on the student record sheet for the scores and dates administered.

The pages of poster art are reproduced in a format size that allows you the latitude of reproducing a set for each student or making transparencies to be used as visual support for a lecture on the subject.

The students' record sheets give you and your students a record of their progress through the packet. The students will enter start and finish dates for each of the tasks and will, in return, expect your initialed acceptance of that work in the block provided for your initials plus any comments necessary. Notice the spaces for entry of pretest/posttest scores at the bottom of the sheet.

Students' activities are based on task cards. Each card provides information and instructions for completing a related activity. There are 24 task cards (12 pages contain the material for producing 2 task cards from each page). Subjects covered in the task cards include math, science, history, geography, health, language, speech, spelling, social studies, music, art, values clarification, and careers. These nonsequential, enrichment activities free you from additional research.

Last is a blank certificate of achievement which may be copied on the school's duplicating machine and used at your discretion.

## TEACHING METHOD

### PREPARATION:

- Cut each task card along the dashed line and glue each to a piece of card stock.
  - A student may accomplish this job.
  - The cards will last longer if they are laminated in plastic.
- Provide materials and supplies in a designated place.
  - Materials list is included.
- Display the enclosed posters (artwork) on a bulletin board where they will be visible and can serve as a source of information.
- Make two tagboard packets and label them SELECT and FINISHED.
  - With this organization, there is less chance of loss. Also, you can quickly see if the cards are being used.
- Write or type the following directions on a 3 x 5 card and tack it between the two tagboard packets:

DIRECTIONS	AFTER YOU HAVE FINISHED EACH TASK
1. Take a task card from the SELECT packet.	1. Enter the date on your record sheet.
2. Enter the date on your record sheet when you start the task.	2. Place your finished work in your folder.
	3. Place the task card in the FINISHED packet.

- Prepare a personalized folder for each student.
  - Provide a copy of the student record sheet.
- 

### PRESENTATION:

- Introduce the bulletin board materials.
  - Explain the information that is provided as part of the display.
- Instruct the students on:
  - The text.
  - How to use the task cards.
  - Where the materials are located.

- Instruct the students to select the task cards in the order of their choice. (Or, at your discretion, assign task cards.)
- Hand out personalized folders and copies of students' record sheets.
  - Explain how to fill out the record sheets.
  - Assign a location for the folders.
- Administer the pretest before the students begin their activities.
  - The test key is included.
  - Record the scores on the students' record sheets.
- Tell students when you will meet again.

**NOTE:** *If small groups will be doing the tasks, it is beneficial to have heterogeneous groups with a stronger reader assigned to a weaker reader.*

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## EVALUATION

- Have students bring in their folders during individualized instruction or reading time, conference time, or at some other acceptable time.
- Go over assignments and initial students' record sheets.
  - Unacceptable work should be returned for reaccomplishment, completion, or proofreading; make an appropriate comment on the students' record sheets.
- Meet with small groups to evaluate assigned work and schedule future plans (skits, etc.). Initial the folder when acceptable.
  - Students may monitor and accept assignments but only with your permission.
- Administer the posttest and record the scores on the students' record sheets.
- Award certificates of achievement to students who have satisfactorily completed the activities given on the task cards and who have shown a gain in knowledge of general aviation.

## THE DEVELOPMENT OF GENERAL AVIATION

At the beginning of the "air age," hot-air balloons, gliders, and airplanes did not need to be placed in classifications or categories. They were all "flying machines," and the ability to get people up into the air was viewed as a spectacular, almost miraculous accomplishment. As the years passed, however, more and more airplanes were developed and manufactured. They became more powerful and could fly increasingly higher and farther. Newer and more efficient designs with better engines were produced each year.

Developments in the science of flight and acceptance of the airplane as a tool crucial both to peace and war have provided our nation with thousands of aircraft that do many things. Over a period of time, these aircraft have been separated into classifications and categories, generally according to who uses them and for what purpose. Today, we classify airplanes as belonging either to military aviation or civil aviation.

*Military Aviation* includes bomber, fighter, transport, reconnaissance, trainer, and other specially built airplanes used by the U.S. military services to help defend our country or to provide humanitarian assistance when needed.

*Civil Aviation* is classified as all aviation activities that are not military. Civil aviation is several times larger in number of airplanes than military aviation. In fact, at the end of 1989, there were 225,515 active U.S. civil aircraft while there were approximately 21,000 active U.S. military aircraft.

When civil aviation is examined further, we find that it has been subdivided into two categories according to how the aircraft are used. In the first category are the *Air*

*Carriers* which use the large 747, DC-10, and L-1011 and the smaller 727, 737, and DC-9. These air carriers, or airliners as we usually call them, are those companies that transport paying passengers and cargo. They fly specified air routes, and their flights are made according to predetermined schedules. As of 1989, the total number of aircraft in the air carrier fleet was 5,778.

Any aircraft in the civil aviation classification that is not an air carrier is part of *General Aviation*, which is the second category within civil aviation. When the number of air carrier aircraft is subtracted from the total number of civil aircraft, we find that the general aviation fleet numbers 219,737. This fleet is made up of many different types of aircraft, from business jets to balloons. We also find aircraft of all ages in this category—those built before World War I and still flying and those that are newly built by private owners who like to build their own flying machines.

Being the largest and most versatile grouping, general aviation has a very significant influence on the lives and welfare of many people. It provides transportation for people and goods, plays a most important role in agriculture, and provides employment for many thousands of workers, both at home and abroad.

Finally, the most important thing to remember about the classifications and categories of aircraft is that everything depends on who is using the aircraft. For example, a particular type of airplane might be of no further use to military aviation but is still capable of performing a service for, say, the Civil Air Patrol. Once transferred to Civil Air Patrol, this airplane would become a part of general aviation.

## TIME SEGMENTS OF GENERAL AVIATION DEVELOPMENT

### The Beginning of General Aviation

General aviation began with the Wright brothers' 1903 flight. This was true for powered, fixed-wing, controllable aircraft. However, we must remember that general aviation includes all aircraft not used by the military or the air carriers and that these aircraft include balloons and gliders. Thus, the Montgolfier-type, hot-air balloons and the various designs of man-carrying gliders were the true beginning of general aviation in the United States. On the other hand, the fixed-wing powered airplane constitutes the overwhelming majority of aircraft

in the general aviation category; therefore, we will give first consideration to this type aircraft as we trace the development of general aviation.

### From 1903 to 1913

Shortly after proving its airworthiness, the Wright airplane was accepted as a military airplane. Most of the early Wright models, however, were used to instruct new pilots and for pleasure flying. Others became attractions for special events such as fairs, and some were used to take paying passengers aloft.

As early as 1909, the Wright airplanes had serious competition in the United States from the Curtiss airplane and from several foreign models which were shipped to the United States to take part in flying competitions and exhibits. Also on June 26, 1909, the first commercial sale of an airplane took place. An improved version of the 1908 Curtiss *June Bug* was sold to the Aeronautic Society of New York for \$7,500.

General aviation activity experienced a sharp increase between 1909 and 1911, and the main reason for this increase was the fierce competition between newspapers for "aviation news." Another reason was the public's sudden interest in flying. The relatively new airplane had captured the public's imagination with flying shows. The performance of spectacular feats and public demand for more elaborate stunts and greater speed resulted in the rapid development of higher-performance aircraft.

The year 1909 might be considered the starting point for international aviation activities. The Wrights and Glenn Curtiss journeyed to Paris to enter the Gordon Bennett Speed Trophy Race in pursuit of the \$10,000 prize money offered by the *New York Herald*. Curtiss won with a speed of 47.4 miles per hour, a phenomenal pace which electrified the public on both sides of the Atlantic. Many European aviators came to the United States in quest of prize money. Between 1909 and 1910, prizes were offered on both a national and international scale in amounts ranging from \$5,000 to over \$90,000. Competition was heightened by the inclusion of the foreign aviators. As an example, at the International Air Meet held at Belmont Park, New York, Britisher Claude Graham-White won the *second* Gordon Bennett Speed Trophy with a speed of 60 mph—only a year earlier the record had been set at 47.4 mph!

More and more people were getting into the general aviation picture and, by 1911, several manufacturers were building airplanes as "professional" devices. Many amateur airplane builders also were involved with aviation projects, and some were injured or killed trying to fly their "built-in-the-backyard" machines.

Glenn L. Martin was an example of the many amateurs who were fortunate enough to become professionals. He was 21 years old and the manager of a garage when he decided to enter aviation. He first built a monoplane, which crashed. Then, he built a biplane of the Curtiss design and taught himself to fly it. Martin became an outstanding pilot and a famous airplane manufacturer.

At the close of 1911, there were 82 pilots in the United States licensed to fly in air meets and exhibitions. In addition to the licensed pilots, there were 50 more who

had flown solo. The licensing authority at that time was the Aero Club of New York—the Federal Government had not as yet entered aviation as a regulatory power.

Since the Wright brothers owned patents on almost every conceivable aviation device, arrangements were made by the promoters of the air meets to pay them a flat rate of \$30,000 for each meet. A 1914 court decision affirmed that the Wright brothers did indeed have a legal claim for patent infringements on heavier-than-air flying machines built in this country and on any foreign aircraft flying in the United States. That court decision gave the Wright Company control of the manufacture and sale of aircraft in the United States.

The Wrights' legal monopoly of aircraft manufacturing, coupled with a waning public interest in exhibition flying and a growing public concern about the many deaths of would-be pilots, undoubtedly slowed the progress of general aviation development in the United States for several years.

#### **From 1914 to 1918**

Because of managerial problems, the Wright brothers did not take advantage of the opportunity to monopolize the aircraft industry. These problems and Wilbur's death were instrumental in Orville selling the company in 1915. Still another setback to general aviation development occurred in 1914—the outbreak of World War I. The war generated U.S. interest in military aviation, and the few existing aircraft manufacturers vied for the potential military market and ignored general aviation.

Airmail, as an officially funded project, became a reality in 1918. On May 15, 1918, President Woodrow Wilson, the Postmaster General, and many other high-ranking officials witnessed the first regularly scheduled airmail flight between Washington and New York. Army pilots opened the route flying Curtiss JN-4 training planes. About three months later, general aviation took over flying airmail with civilian pilots using ex-military planes for the first flights. However, it was not long until civilian aircraft manufacturers produced airplanes especially designed and built to carry airmail.

#### **From 1919 to 1929**

At the close of World War I, general aviation consisted of surplus military planes—the DH-4, a copy of a British design, and the Curtiss JN-4, a two-place training plane. Most manufacturers set up for wartime production went back to manufacturing their prewar products. However, in 1919, the Curtiss Company produced a four-place flying boat that was an adaptation of a model produced for the Navy.



General aviation at this time actually consisted of the cheap-to-buy surplus military planes which were used by enterprising pilots to give instruction, sell rides to the public, and put on barnstorming air shows.

By 1925, crashes and neglect had diminished the surplus war planes and the barnstormers needed new and better-performing airplanes. Several new companies such as Waco, Travelair, Laird, and Cessna were formed to supply the demands of this market.

Still, general aviation, as we know it today, made very little progress as the economy "heated up" and headed toward the 1929 stock market crash. While it was true that Lindbergh's 1927 flight was followed by heavy investment in aviation stocks, manufacturers were concentrating on special orders, such as commercial aircraft and military prototype aircraft. In the general aviation category, a few corporate (company-owned) aircraft and planes for wealthy individuals were built and sold for amounts ranging from \$30,000 to \$100,000.

#### **From 1930 to 1940**

While thousands of businesses failed in the stock market crash of 1929, the established aircraft manufacturers survived and some even prospered because of Federal money made available for the development of military airplanes. On the other hand, most of general aviation suffered along with the rest of the economy simply because the people who made up the general aviation market did not have the money to buy and maintain airplanes. Actually, it wasn't until the mid-1930s that general aviation began to emerge. By this time, the economic situation in the country had improved somewhat, and a small market for private and corporate aircraft was developing.

#### **From 1941 to 1944**

The manufacture of general aviation aircraft stopped for the duration of our involvement in World War II. The few general aviation planes that continued to be produced were built to military specifications as either primary trainers, observation craft, or light transports.

Skilled aircraft workers and their employers were quickly pressed into developing and building military airplanes. Production efficiency leaped forward and within slightly more than three years the aircraft industry was producing at the 100,000 craft-per-year level. What was to happen to this great capacity for production? Would the postwar military, commercial, and general aviation markets keep it going? The answer was no. The market simply would not be there, either in the United States or abroad. Although many men and

women had become pilots for the military services, their primary interest was to return home, resume a normal life, and make up for the years spent at war. For these pilots, aviation was of secondary importance for several years.

#### **From Post-World War II to Present**

In 1944, the Civil Aeronautics Administration projected a rapid growth in aviation and planned for an air traffic control program capable of handling up to 500,000 aircraft by 1950. The projection proved wrong. When war ended, the boom in military aircraft production also ended. The established aircraft manufacturers that had prepared for the projected increase in demand and sales of civil aircraft cut back severely, and many newcomers lured into the general aviation manufacturing field by the prospective market failed. Thousands of aircraft workers had to find other employment as the wartime aircraft manufacturers resumed the manufacture of nonaviation products.

Even if aircraft could have been manufactured for the large market of private owners projected, there were relatively few airports in 1945. Only 3,000 small general aviation-type airports existed in the nation. This number increased slightly after the war when some military airports were converted to civilian use. Today, we have over 17,000 suitable airports. This seemingly large number of airports provides air transportation for only a relatively few townships across the land. There are thousands of communities which could have a more prosperous economy if they understood fully the benefits to be derived from a local airport. In 1926, Colonel (now General) Billy Mitchell said, "If you were to measure the heartbeat of a city . . . take the pulse of her airport."

Of the general aviation aircraft manufacturers who vied for the post-World War II market and survived, a few cater only to the general aviation market while others produce a mixture of military and civil aircraft components for aerospace vehicles. Cessna and Piper are the two largest producers of general aviation trainers and personal-transportation aircraft. Cessna also produces a few military trainers.

Even in recent times, with a manufacturing capability to produce any type of general aviation airplane imaginable, the market continues to fluctuate according to the demand for new aircraft. Manufacturers of aircraft, like any other business, try to anticipate what the aviation community wants and needs and to design and build accordingly. Recent trends point toward a better "middle market," indicating an increased demand for larger, more sophisticated general aviation aircraft in the cor-

porate aircraft and small charter flight classifications.

The general aviation market fluctuated up to the peak year of 1978 when 18,962 general aviation aircraft were produced for domestic use and export to other countries. After that peak and until 1990, the market has shown a drastic decline to 2,268. This depressed market in general aviation has been brought about by more sales at increasing prices in other categories of aviation. The higher value for fewer airplanes is explained by sales increases in high-value commercial transports and certain military aircraft, coupled with a major production decline in the lower-priced end of the general aviation category.

The future of general aviation will continue to depend on the state of the economy, the desires of the people who use general aviation, and, most importantly, on the understanding of its importance by our government and by the public. The costs can become so high that people no longer can afford to take part in the activity.

On the brighter side, general aviation will survive and will continue to provide jobs and services for the American public. We have become highly dependent on this largest segment of all aviation activities, and there is no substitute for the services it can and does provide.

## MATERIALS LIST

- |      |     |  |
|------|-----|--|
| TASK | 1.  | Paper and pencil.  |
| TASK | 2.  | Paper and pencil.  |
| TASK | 3.  | Paper and pencil.  |
| TASK | 4.  | Paper and pencil.  |
| TASK | 5.  | Paper and pencil.  |
| TASK | 6.  | Paper, pencil, encyclopedia, and history book.                                       |
| TASK | 7.  | Paper, pencil, encyclopedia, geography book,<br>and <i>World Almanac</i> .           |
| TASK | 8.  | Paper, pencil, geography book, and <i>World<br/>Almanac</i> .                        |
| TASK | 9.  | Paper, pencil, geography book, and <i>World Atlas</i> .                              |
| TASK | 10. | Paper and pencil.  |
| TASK | 11. | Paper, pencil, and dictionary.   |
| TASK | 12. | Paper, pencil, and dictionary.   |
| TASK | 13. | Paper and pencil.  |
| TASK | 14. | Paper, pencil, and dictionary.   |
| TASK | 15. | Paper, pencil, and encyclopedia.   |
| TASK | 16. | Paper, pencil, Bunsen burner, ceramic bowl, and<br>feather.                          |
| TASK | 17. | Paper and pencil.  |
| TASK | 18. | Paper and pencil.  |
| TASK | 19. | None.  |
| TASK | 20. | Paper, pencil, charcoal stick or pen and ink, and<br>tagboard or construction paper. |
| TASK | 21. | Construction paper or poster board, glue,<br>magazines, newspapers, and scissors.    |
| TASK | 22. | Paper, pencil, and small prize.  |
| TASK | 23. | Paper and pencil.  |
| TASK | 24. | None.  |

## SUGGESTIONS FOR EVALUATING STUDENT ACTIVITIES

### TASK 1—MATHEMATICS

- (1) 1996  
– 1918 year built  
78 years old in 1996
- (2) Hours x 12 months x years = hours flown:  
 $3 \times 12 \times 78 = 2,808$
- (3) Hours flown x 50 mph = miles will have flown by 1996:  
 $2,808 \times 50 = 140,400$

### TASK 2—MATHEMATICS

Airplane "A"		Airplane "B"	
empty weight =	1,200	empty weight =	1,200
oil (8/4 x 7.5) =	15	oil (8/4=7.5) =	15
fuel (50 x 6) =	300	fuel (40 x 6) =	240
passengers =	340	passengers =	400
passengers =	244	passengers =	256
baggage =	200	baggage =	190
Gross Weight	<u>2,299</u>	Gross Weight	<u>2,301</u>

**NOTE:** Airplane "B" is over the maximum gross weight by 1 pound.

### TASK 3—MATHEMATICS

- (1) Federal tax x 50 gallons total = federal tax:  
 $08 \times 50 \text{ gallons} = \$4.00$
- (2) Standard tax x 50 gallons = total standard tax:  
 $.09 \times 50 = \$4.50$
- (3) State tax x 50 gallons = total state tax:  
 $.07 \times 50 = \$3.50$
- (4)

Total federal tax	\$4.00
Total standard tax	4.50
Total state tax	<u>3.50</u>
Total Tax	<u>\$12.00</u>
- (5)

Aviation fuel per gallon	\$1.75
– federal tax	.08
– standard tax	.09
– state tax	<u>.07</u>
Total w/o Tax	<u>\$1.51</u>

### TASK 4—MATHEMATICS

- (1) Ground Temperature 70°F      70°F  
– Temperature change  $10 \times 3.5^\circ$       -35°F  
Temperature at 10,000 Feet      35°F
- (2) Cold. It's only 3° above water freezing temperature.

### TASK 5—MATHEMATICS

- (1) Capacity – reserve = gallons used:  
 $50 - 2 = 48$   
  
Gallons used/gallons per hour = hours flown:  
 $48 \div 8 = 6$
- (2) Ground speed x hours flown = distance traveled:  
 $120 \times 6 = 720$
- (3) Distance traveled/2 = halfway point:  
 $720 \div 2 = 360$
- (4) Altitude – mile (in feet) = difference:  
 $5,500 - 5,280 = 220$   
(220 feet more than a mile)

#### **NOTE:**

- Altitude – nautical mile (in feet) = difference:  
 $5,500 - 6,080 = 580$   
(580 feet less than a nautical mile)

### TASK 6—SOCIAL STUDIES/HISTORY

- (1) 12 to 14 million.
- (2) Free "bread lines" or "soup kitchens."
- (3) 1929.
- (4) 1933.  
  
Draft of letter about depression and how it affected student.

**TASK 7—SOCIAL STUDIES/GEOGRAPHY**

- (1) Topeka, Columbus.
- (2) Over 3,000,000; over 10,000,000.
- (3) Nebraska, Iowa, Missouri, Oklahoma, and Colorado.
- (4) Indiana, Michigan, Pennsylvania, West Virginia, and Kentucky.

**TASK 8—SOCIAL STUDIES/GEOGRAPHY***List of States:*

Arizona  
California  
Colorado  
Idaho  
Montana  
Nevada  
New Mexico  
Oregon  
Utah  
Washington  
Wyoming

**TASK 9—GEOGRAPHY**

- (1) Atlantic, Pacific, and Indian.
- (2) At the Ross Sea-Antarctica shoreline.
- (3) Mt. Markham.

**TASK 10—SOCIAL STUDIES**

Copy of letter should have at least an introductory statement and a clearly stated request for the information.

**TASK 11—LANGUAGE**

- (1) Definition of hot-air balloon:  
  
"A nonporous bag of tough, lightweight material filled with heated air so as to rise and float in the atmosphere."  
  
*Webster's New Collegiate Dictionary*
- (2) Description of flight.

**TASK 12—LANGUAGE****Definitions for:**

- |                  |   |
|------------------|---|
| <i>Aviation.</i> | <ol style="list-style-type: none"> <li>1. The operation of heavier-than-air craft.</li> <li>2. Military airplanes.</li> <li>3. Airplane manufacture, development, and design.</li> </ol>  |
| <i>Military.</i> | <ol style="list-style-type: none"> <li>1. Of or related to soldiers, arms, or war.</li> <li>2. Of or related to ground or sometimes ground and air forces as opposed to naval forces.</li> <li>3. Performed or made by armed forces.</li> </ol>                               |
| <i>Air.</i>      | <ol style="list-style-type: none"> <li>1. The mixture of invisible, odorless, tasteless gases that surrounds the earth.</li> <li>2. A light breeze.</li> <li>3. Empty space.</li> </ol>   |
| <i>Carrier.</i>  | <ol style="list-style-type: none"> <li>1. An organization engaged in transporting passengers or goods for hire.</li> <li>2. A device or machine that carries.</li> <li>3. A container for carrying.</li> </ol>  |
| <i>General.</i>  | <ol style="list-style-type: none"> <li>1. Involving or applicable to the whole.</li> <li>2. Involving, relating to, or applicable to every member of a class, kind, or group.</li> <li>3. Applicable to or characteristic of the majority of individuals involved.</li> </ol> |

**TASK 13—LANGUAGE**

The article should have an attention-getting headline about the air show and contain enough detail to answer most of the journalistic questions of who, where, what, when, etc.

## TASK 14—LANGUAGE/SPELLING

### Definitions for:

<i>Fuselage.</i>	The central body portion of an airplane designed to accommodate the crew and the passengers or cargo.
<i>Wing.</i>	One of the airfoils that develop a major part of the lift which supports a heavier-than-air craft.
<i>Cowling.</i>	A removable metal covering that houses the engine and sometimes a part of the fuselage or nacelle of an airplane.
<i>Fairing.</i>	A member or structure whose primary function is to produce a smooth outline and to reduce drag or air resistance (as on an airplane).
<i>Strut.</i>	A structural piece designed to resist pressure in the direction of its length.
<i>Aileron.</i>	A movable part of an airplane wing or a movable airfoil external to the wing at the trailing edge for imparting a rolling motion and thus providing lateral control.
<i>Elevator.</i>	A movable airfoil attached to the tail of an airplane for producing up and down motion.
<i>Rudder.</i>	A movable airfoil attached to the rear end that serves to control direction of flight of an airplane in the horizontal plane.
<i>Flap.</i>	A movable airfoil attached to an airplane wing's trailing edge to increase lift or drag.
<i>Airfoil.</i>	A body designed to provide a desired reaction force when in motion relative to the surrounding air.

## TASK 15—SCIENCE

- (1) A fire ant's mound is like a stone to the landing gear of an airplane. If an airplane, just after landing or on takeoff roll, should hit one, the damage caused could be anything from a loud bump to a bent airplane—a bad situation that all pilots like to avoid.
- (2) South America.
- (3) *Solenopsis geminata*.

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## TASK 16—SCIENCE

- (1) Results of three experiments.
- (2) Ensure that conclusions are valid.

---

## TASK 17—SPEECH

- (1) List of uses for general aviation aircraft.
- (2) Ensure that oral report has an introduction, body, and conclusion.

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## TASK 18—VALUES CLARIFICATION/SPEECH

- (1) Names of city council members, record of vote, and council notes.
- (2) Also, ensure oral report has an introduction, body, and conclusion.

---

## TASK 19—VALUES CLARIFICATION

Date of debate.

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## TASK 20—ART

Drawing of airplane.

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## TASK 21—ART

Display of montage.

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## TASK 22—MUSIC

List of song titles.

---

## TASK 23—CAREERS

Information on general aviation job opportunities.

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## TASK 24—HEALTH

Report on aeromedical services and benefits to local community.

## TEST

1. Of all the airplanes in the United States, the
  - a. airlines have the most.
  - b. military has the most.
  - c. government has the most.
  - d. "general aviation" classification has the most.
2. The first airmail flight in the United States was flown by
  - a. Army aviators.
  - b. Navy aviators.
  - c. civilian aviators.
  - d. Marine Corps aviators.
3. The United States Army's first airplane was built
  - a. in France.
  - b. in Germany.
  - c. by Glenn Curtiss.
  - d. by the Wright brothers.
4. The General Aviation category includes
  - a. FAA aircraft.
  - b. military aircraft.
  - c. the *Space Shuttle Enterprise*.
  - d. none of the above.
5. In which of the following states is a large number of airplanes produced?
  - a. Kansas
  - b. Montana
  - c. Tennessee
  - d. New Mexico
6. About how many airports are there in the United States?
  - a. 2,500
  - b. 17,000
  - c. 50,000
  - d. 100,000
7. If an airplane is more than 10 years old, it is considered to be worn out.
  - a. True
  - b. False
8. During World War II, about half of all the airplanes built were for civilian use.
  - a. True
  - b. False
9. Regulations on aviation usually result in more expense for the users of aviation services.
  - a. True
  - b. False
10. It is a fact that a community's economic status is improved if it has an airport.
  - a. True
  - b. False

## TEST KEY

1. d	6. b
2. a	7. b
3. d	8. b
4. d	9. a
5. a	10. a



# STUDENT RECORD SHEET

GENERAL AVIATION  
BY

\_\_\_\_\_  
(STUDENT'S NAME)

	Started	Finished	Comments	Initials
Task 1—Mathematics				
Task 2—Mathematics				
Task 3—Mathematics				
Task 4—Mathematics				
Task 5—Mathematics				
Task 6—Social Studies/History				
Task 7—Social Studies/Geography				
Task 8—Social Studies/Geography				
Task 9—Geography				
Task 10—Social Studies				
Task 11—Language				
Task 12—Language				
Task 13—Language				
Task 14—Language/Spelling				
Task 15—Science				
Task 16—Science				
Task 17—Speech				
Task 18—Values Clarification/Speech				
Task 19—Values Clarification				
Task 20—Art				
Task 21—Art				
Task 22—Music				
Task 23—Careers				
Task 24—Health				

Pretest Score:	Date:	Posttest Score:	Date:
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### TASK 1 - MATHEMATICS

Airplanes can last a very long time. Some models that were built during World War I are still flying and, with proper care, they could still be flying in 1996.

1. If an airplane was built in 1918, how old will it be in 1996?
2. If this airplane has flown an average of three hours per month since it was built and continues to fly at this rate until 1996, how many hours will it have flown by that time?
3. Using the answer for #2, find the number of miles the airplane will have flown by 1996 if its average ground speed is 50 miles per hour.

PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.

### TASK 2 - MATHEMATICS

All airplanes have a limit to the amount of weight they can safely carry into the air. This is called the MAXIMUM GROSS WEIGHT. When calculating whether or not the airplane is within its maximum gross weight, the pilot must figure the weight of the passengers and the weight of the baggage carried. All of this weight must be added to the empty weight of the airplane.

Using the above information, on a separate sheet of paper calculate whether airplane "A" or airplane "B" is over the maximum gross weight of 2,300 pounds.

Airplane "A" (1,200 lb empty wt)

8 qts oil (7.5 lb per gal)

50 gal fuel (6 lb per gal)

Front seat passengers (2)

Rear seat passengers (2)

Baggage

Gross Weight

\_\_\_\_\_

\_\_\_\_\_

340 lb

244 lb

200 lb

\_\_\_\_\_

Airplane "B" (1,200 lb empty wt)

8 qts oil (7.5 lb per gal)

40 gal fuel (6 lb per gal)

Front seat passengers (2)

Rear seat passengers (2)

Baggage

Gross Weight

\_\_\_\_\_

\_\_\_\_\_

400 lb

256 lb

190 lb

\_\_\_\_\_

PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.

### **TASK 3 - MATHEMATICS**

Aviators pay more tax on aviation fuel than automobile drivers do on gasoline. Let's find out how much this tax is for full fuel tanks on an airplane that hold 50 gallons.

You are filling your tanks in a state where aviation fuel costs \$1.75 per gallon. Looking at the tax breakdown: The Federal tax is 8 cents per gallon; the state charges 9 cents per gallon standard fuel tax plus another 7 cents per gallon aviation fuel tax. Now:

1. How much Federal tax is there on the 50 gallons of fuel you need to fill the tanks?
2. How much standard fuel tax?
3. How much state aviation fuel tax?
4. How much is the total tax?
5. How much would the fuel cost be per gallon if there were no taxes to pay?

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 4 - MATHEMATICS**

Aviators know that the air gets cooler the higher one flies. Aviation and weather specialists tell us that the temperature drops about  $3\frac{1}{2}$  degrees Fahrenheit ( $3.5^{\circ}\text{F}$ ) for each 1,000 feet we travel upward.

Suppose that you are flying in a hot-air balloon and are 10,000 feet above the ground. At the time you left the ground, the temperature was  $70^{\circ}\text{F}$ .

1. What is the temperature at 10,000 feet above the ground?
2. Is it cold or hot?

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 5 - MATHEMATICS**

Modern, small, general aviation aircraft use fuel at the rate of about 8 gallons per hour. Pilots use this rate to figure out how long they can remain in flight and still have enough fuel left for landing at the destination airport or at the airport used as a refueling stop on a long flight.

If you had an airplane with a 50-gallon fuel capacity that used 8 gallons of fuel per hour:

1. How long could you remain in flight and still have 2 gallons of fuel left in the plane's tanks?
2. If your ground speed on this flight was 120 miles per hour, how far did you travel?
3. If you made a refueling stop at the halfway point in this flight, how far would you have traveled from the starting point?
4. The highest altitude you reached during this flight was 5,500 feet. Was this more or less than a mile high? How much more or less?

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 6 - SOCIAL STUDIES/HISTORY**

General aviation development ground to a halt when the United States entered the "Great Depression." Using an encyclopedia and history book, read about what life was like in our country during this period.

Answer the following:

1. How many people lost their jobs?
2. How did hungry, unemployed people in large cities get food?
3. When did the "Great Depression" start?
4. What year was the depression at its worst?

Pretend you are living at the time of the "Great Depression." Write a letter to a friend describing how it is affecting your family, your job, and your town.

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 7 - SOCIAL STUDIES/GEOGRAPHY**

General aviation was begun by the Wright brothers who lived and worked in Ohio. Today, most small general aviation airplanes are built in Kansas. Use your geography book, an encyclopedia, or *World Almanac* to find out things about these states.

Answer the questions below. Write your answers on a sheet of paper; add anything you find interesting about either or both states.

1. What is the capital of Kansas? of Ohio?
2. About how many people live in Kansas? in Ohio?
3. What are the names of the states which border on Kansas?
4. What states border on Ohio?

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 8 - SOCIAL STUDIES/GEOGRAPHY**

Small general aviation airplanes cannot fly very high. In fact, most of these small airplanes will only climb to 12,000 feet or so above sea level when they are loaded with passengers and baggage. This means that pilots must be careful when they are flying in or across mountainous states.

It is good practice to allow a 2,000-foot clearance between the airplane and the mountain it is flying over. Use a geography book or *World Almanac* and list the states (excluding Hawaii and Alaska) which have mountains that are 10,000 or more feet above sea level.

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

## **TASK 9 - GEOGRAPHY**

On November 28, 1927, Admiral Byrd and a crew of three flew from Little America to the South Pole. They flew over the Queen Maud Mountains where strong winds and downdrafts threatened their small plane. Finally, a sudden upward rush of wind boosted them over the crest and a white plateau, more than 10,000 feet up in the sky, spread out before them. They flew a straight course for 400 more miles and, at 1:14 a.m., Admiral Byrd dropped a weighted flag on the South Pole and his radioman flashed the news of their arrival to the world.

Use your geography book or a *World Atlas* and answer the following questions:

1. What oceans surround Antarctica?
2. Where is the Bay of Whales?
3. What is the highest peak in the Queen Maud Mountains?

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

## **TASK 10 - SOCIAL STUDIES**

The Wright brothers entered the world of flight by way of kites and gliders. From trial flights with these experimental aircraft, they conceived the idea of building a plane with an engine and propellers to carry it into the air.

Being good businessmen, the Wrights took the precaution of applying for a patent on their invention. They did not want "spies" to steal their design. The patent was granted in 1906.

Write to the Commissioner of Patents, Washington, D.C. 20231 and ask for information on how to file for a patent, how a patent protects an inventor under the law, and any other information you might like to have about patents. Share your information with your class.

**PLACE A COPY OF YOUR COMPLETED LETTER IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

## TASK 11 - LANGUAGE

Hot-air balloons were among the first *aircraft* invented, and they were the first to carry men and women up into the atmosphere. Many people today fly hot-air balloons and all who go up in them seem to like the adventure very much.

To complete this task card, do the following:

1. Look up the word *aircraft* in your dictionary and find out why hot-air balloons are considered aircraft. Write your findings on a piece of paper.
2. Use your imagination and describe a flight in a hot-air balloon. Think of:  
  
the sizes of people and objects as the balloon climbs,  
the sounds you will hear,  
the change in the temperature,  
your speed over the ground,  
the colors you will see, etc.

**PLACE YOUR FINDINGS AND FLIGHT DESCRIPTION IN YOUR FOLDER. DATE YOUR RECORD.**

## TASK 12 - LANGUAGE

We know that aviation in the United States is divided into Military Aviation and Civil Aviation. We also know that Civil Aviation is subdivided into Air Carriers and General Aviation. But what do we really understand about the meanings of these words: *aviation*, *military*, *air*, *carrier*, and *general*?

On a piece of paper, list each italicized word. Use your dictionary and write three definitions for each word. Decide which definition *best* fits how the word is used here.

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### TASK 13 - LANGUAGE

In the 1920s when Charles Lindbergh and many others were putting on air shows, making parachute jumps, and taking people for plane rides, there weren't many airports. Most of these "barnstormer" pilots used pastures and open fields as their airports.

Imagine that you are a reporter covering one of these air shows for your newspaper. Write an article, using as much detail as you like, describing what you see. Choose a headline for your article that will capture the interest of your readers.

PLACE A COPY OF YOUR HEADLINE ARTICLE IN YOUR FOLDER. DATE YOUR RECORD SHEET.

### TASK 14 - LANGUAGE/SPELLING

People who work in aviation use many words that apply only to aviation. There are other more common words which have a special meaning to aviators and a different meaning to nonaviators.

Write the words listed below on a separate sheet of paper. Using your dictionary, look up each word and write its *aviation* meaning beside it. Go over your completed list again and again until you are sure that you can spell each word and can remember its meaning. Let a fellow student test you.

- |             |             |
|-------------|-------------|
| 1. Fuselage | 6. Aileron  |
| 2. Wing     | 7. Elevator |
| 3. Cowling  | 8. Rudder   |
| 4. Fairing  | 9. Flap     |
| 5. Strut    | 10. Airfoil |

PLACE YOUR COMPLETED WORD LIST IN YOUR FOLDER. DATE YOUR RECORD SHEET.



### **TASK 15 - SCIENCE**

Early aviators landed their airplanes in pastures, fields, and most any clearing that appeared suitable from the air. Today, pastures and fields can also be used by small airplanes but some of these improvised airports contain a new danger—fire ants!

Use an encyclopedia to read about fire ants and answer the following questions.

1. Why are fire ants dangerous to an airplane landing in a pasture—especially in the southern part of the United States?
2. The fire ant is not native to the United States. Where did it migrate from?
3. What is the fire ant's scientific name?

**PLACE THE RESULTS OF YOUR RESEARCH IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 16 - SCIENCE**

When hot-air balloons were invented, it was believed that the balloons went up because of the smoke generated by the fires built under them. After all, smoke rises! Was this true? Let's find out by conducting some experiments.

(Note the results of each experiment on a sheet of paper.)

1. Place a small amount of paper in a ceramic bowl and light it. What happened to the smoke?
2. Repeat this experiment but place a very light feather in the smoke and let go of it. What happened to the feather? Did the smoke carry it upward?
3. Using a smokeless heat source (Bunsen burner or the eye of an electric or gas stove), hold the feather above the heat source and let go of it. What happened to the feather?

Does the smoke or the heated air carry a hot-air balloon aloft? How did you arrive at this conclusion?

**PLACE THE RESULTS OF YOUR EXPERIMENTS AND YOUR CONCLUSION IN YOUR FOLDER. DATE YOUR RECORD SHEETS.**

### **TASK 17- SPEECH**

General aviation planes are used to spray and dust farmers' crops and for seeding and fertilizing the soil. They are also used for forestry and fishing patrol, for charter flying of passengers and freight, and for rescue and ambulance work. The world's biggest oil companies also use helicopters as transportation to and from their off-shore oil rigs.

Think of other uses for general aviation aircraft. Write your thoughts down on a piece of paper. Pick one of these ideas and research it. Give an oral report to your class on the topic you chose to research.

**AFTER YOU HAVE MADE YOUR REPORT, DATE YOUR RECORD SHEET.**

### **TASK 18 - VALUES CLARIFICATION/SPEECH**

Airports improve the economy of a community and provide employment for both skilled and unskilled workers. They provide rapid, safe transportation for people and products. On the other hand, some people believe that airports take up too much land and add to noise and air pollution. These people do not want an airport in their community.

Select four of your classmates and imagine that your group represents a city council that must consider establishing a small airport. Give each person a week to gather information and then have a council meeting to decide whether or not the airport will be constructed.

Make notes on the reasons given "for" and "against" the airport; ask the council to vote and record the vote. Give an oral report to the rest of the class on the decision of your city council.

**PLACE YOUR NOTES AND THE NAMES OF THE COUNCIL MEMBERS IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 19 - VALUES CLARIFICATION**

Pretend you are one of a group of young people working on an invention that will enable people to travel through the air on “wings.”

You have designed a basic aircraft, another member of the group has invented a lightweight engine, and another has perfected steering and landing parts for the invention.

You have watched them work and have learned how to build the parts they have invented.

Should you ask them to join you to combine their inventions with yours and build the total craft, or should you quickly apply for a patent on the part you have designed? Perhaps you should apply for a patent on all the parts, yours and theirs, and force them to work for you in order to use and sell their invention.

Choose teams of four and debate the ethics of this issue.

**AFTER YOU HAVE HELD THE DEBATE, DATE YOUR RECORD SHEET.**

### **TASK 20 - ART**

Study the airplanes shown on the art panels in this packet and decide which one you like best.

On a sheet of paper, tagboard, or construction paper draw a picture of the airplane you have chosen. You can use a pencil, charcoal stick, or pen and ink to make your drawing.

Do the following:

1. Draw your airplane either in flight or on the ground.
2. If you draw it in flight, include some clouds.
3. If the airplane is on the ground, include some trees and buildings (perhaps a hangar) in the background.

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 21 - ART**

Remembering that general aviation includes all aviation not considered military or air carrier, search magazines and newspapers for pictures of general aviation activities. Cut these pictures out and place them on poster board or construction paper. Arrange them into a MONTAGE and glue them in place.

Take care to make your montage as attractive as possible. If any of the pictures have descriptive captions, you might consider leaving the captions attached.

**DISPLAY YOUR WORK. DATE YOUR RECORD SHEET.**

### **TASK 22 - MUSIC**

In the early 1900s, songs like “Come Josephine in My Flying Machine” and dance steps like the “Lindy Hop” were popular because of the “aviation craze” sweeping the country.

Choose seven of your classmates and form two teams of four members each. See how many songs you can think of that refer to flying. Write the titles on a piece of paper. Award a small prize to the team that has the largest number of correct titles.

**WHEN THE PRIZE HAS BEEN AWARDED, DATE YOUR RECORD SHEET.**

### **TASK 23 - CAREERS**

General aviation offers many opportunities for an exciting career. From the drawing board to the cockpit there are hundreds of aviation-associated jobs.

Pretend you are job hunting and you want a job in the general aviation field. Write letters to several aircraft manufacturing companies and request information about job opportunities. Visit or write your local airport, a travel bureau, an oil company, or the Federal Aviation Administration for more information about jobs related to aviation.

Write your findings on a piece of paper. Decide which job you think you would enjoy, the one that fits you best. Write a letter applying for that job.

**PLACE YOUR COMPLETED WORK IN YOUR FOLDER. DATE YOUR RECORD SHEET.**

### **TASK 24 - HEALTH**

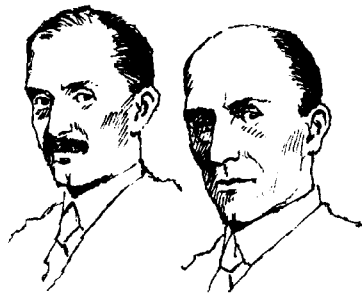
The airplane is flown many miles on mercy missions. In Australia, the Royal Flying Doctor Service provides medical attention and ambulance service to an area covering more than one-half million square miles.

Vaccines to fight polio and other dreaded diseases are flown to people in all parts of the world, and seriously ill or injured patients are transported to distant hospitals for medical care. Shriners use planes to transport crippled and burned children to Shrine Hospitals for treatment or surgery.

Contact a charter aeromedical service or the Shrine Temple in your community. Find out what part the airplane plays in providing good medical care for the citizens of your community. Report your findings to the class.

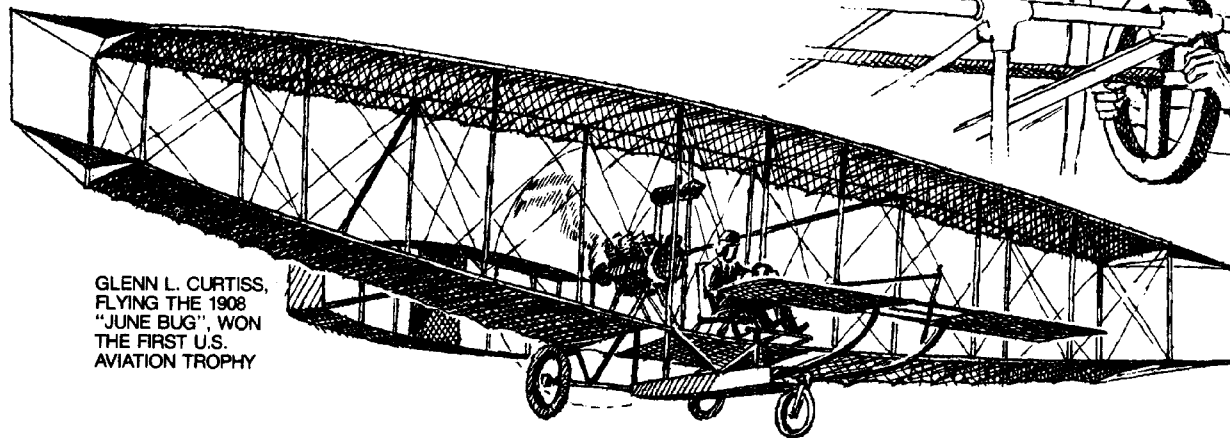
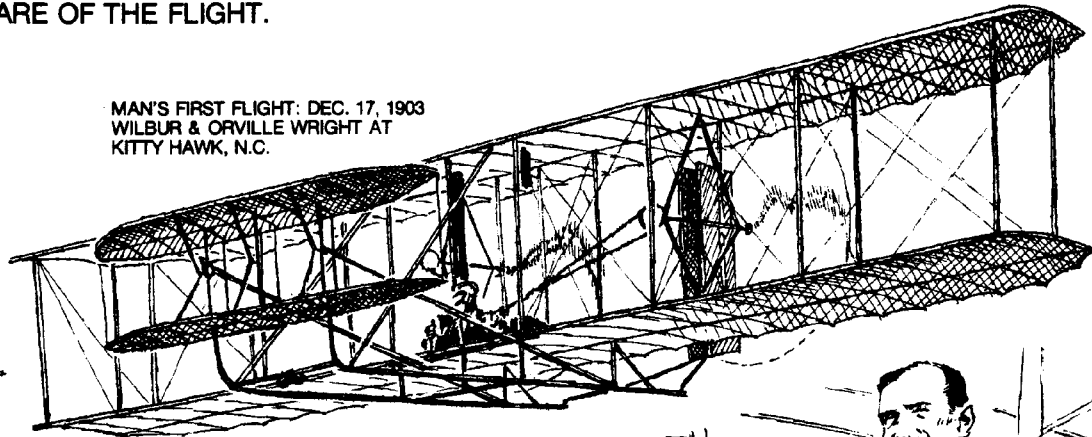
**WHEN YOU HAVE MADE YOUR REPORT, DATE YOUR RECORD SHEET.**

GENERAL AVIATION BEGAN WITH THE WRIGHT BROTHERS' 1903 FLIGHT, BUT MOST PEOPLE WERE UNAWARE OF THE FLIGHT.

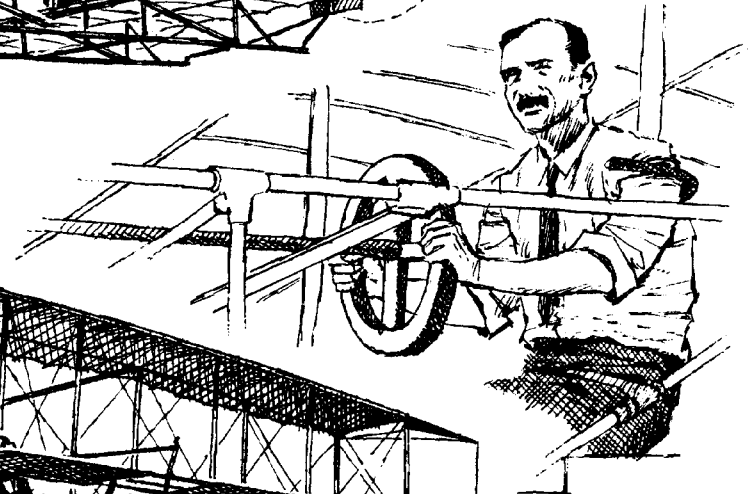


ORVILLE & WILBUR WRIGHT

MAN'S FIRST FLIGHT: DEC. 17, 1903  
WILBUR & ORVILLE WRIGHT AT  
KITTY HAWK, N.C.



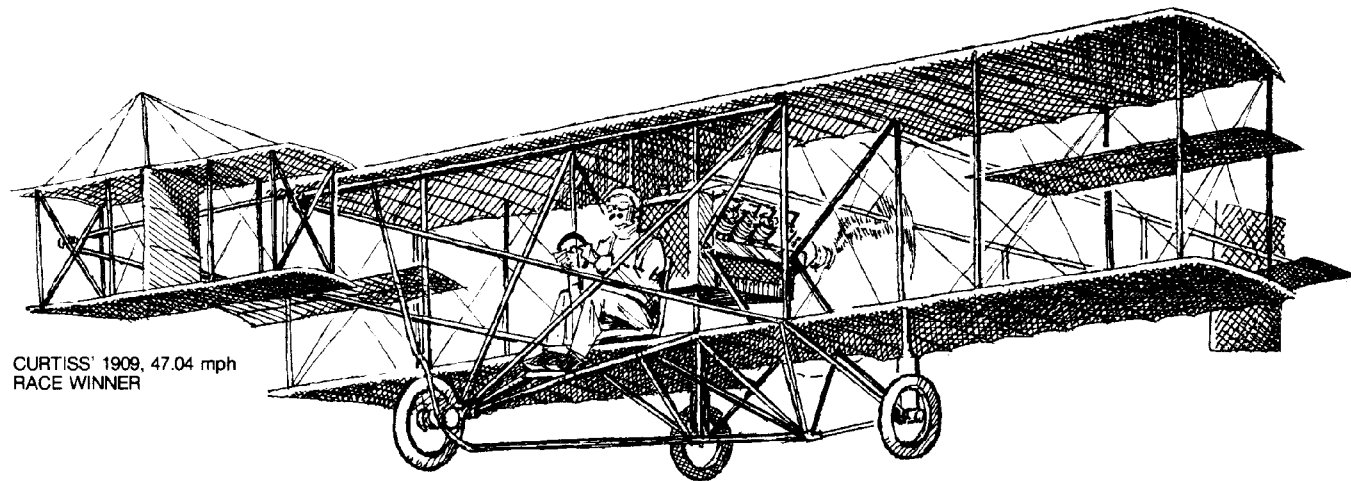
GLENN L. CURTISS,  
FLYING THE 1908  
"JUNE BUG", WON  
THE FIRST U.S.  
AVIATION TROPHY



GLENN CURTISS

OTHER AIRPLANE BUILDER/AVIATORS SUCH AS GLENN CURTISS SOON BEGAN TO TEST THEIR SKILLS AND TRY THEIR LUCK WITH AVIATION.

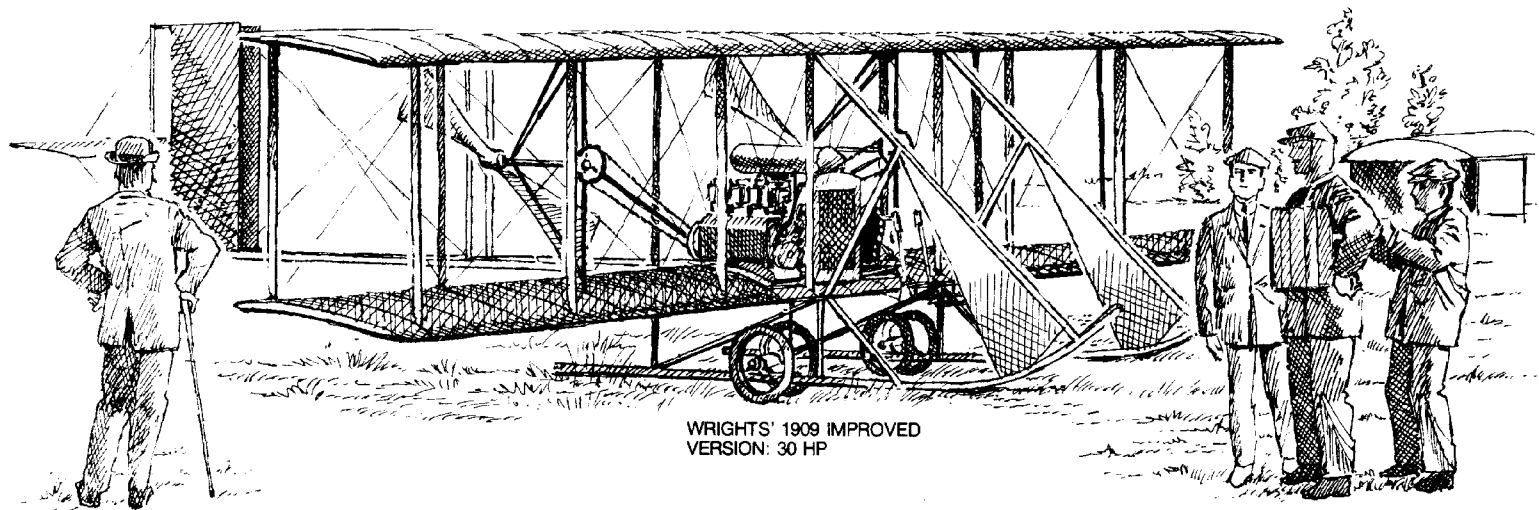
IN 1908, THE "JUNE BUG" WON THE FIRST U.S. AVIATION TROPHY, AND THE WRIGHT BROTHERS TOOK THE FIRST AIRPLANE PASSENGER ALOFT.



CURTISS' 1909, 47.04 mph  
RACE WINNER

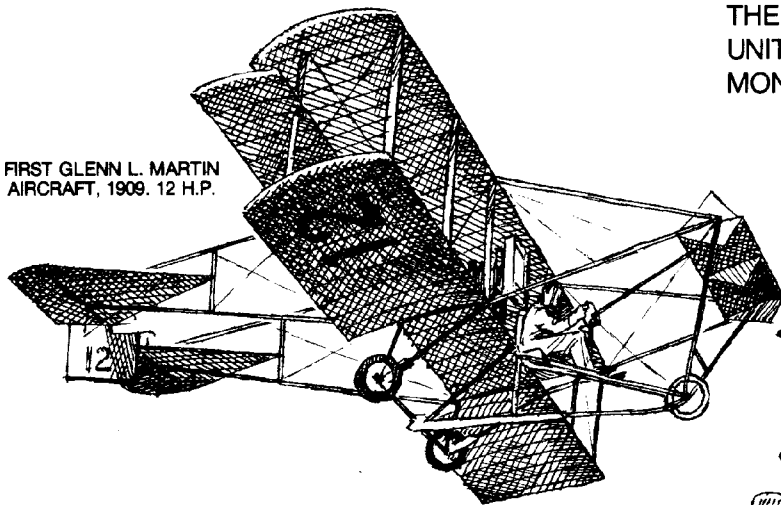
CURTISS' 1909 MODEL COULD OUTFLY THE WRIGHTS' 1909 MODEL. THE CURTISS AIRPLANE SET A SPEED RECORD OF 47.04 mph IN 1909 WHILE RACING AGAINST THE WRIGHT AND OTHER TYPES OF EARLY AIRPLANES.

ALTHOUGH THE WRIGHTS WERE THE INVENTORS, THEY DID NOT MAKE RAPID TECHNOLOGICAL IMPROVEMENTS TO THEIR MACHINES AS DID CURTISS AND OTHERS.



WRIGHTS' 1909 IMPROVED  
VERSION: 30 HP

FIRST GLENN L. MARTIN  
AIRCRAFT, 1909. 12 H.P.

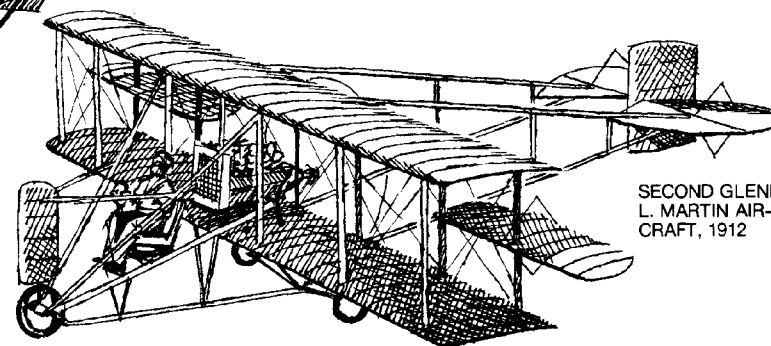


GLENN MARTIN BUILT HIS FIRST AIRPLANE IN 1909.  
HIS SECOND MODEL (1912) WAS A BETTER AND  
MORE SUCCESSFUL ONE.

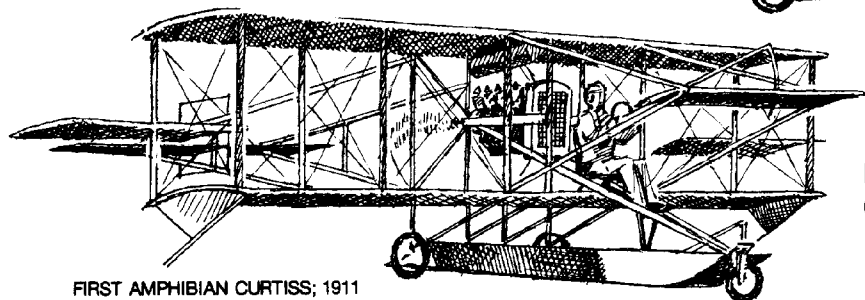
THE "WALDEN," BUILT IN 1910, WAS THE  
UNITED STATES' FIRST SUCCESSFUL  
MONOPLANE.



THE "WALDEN", 1910



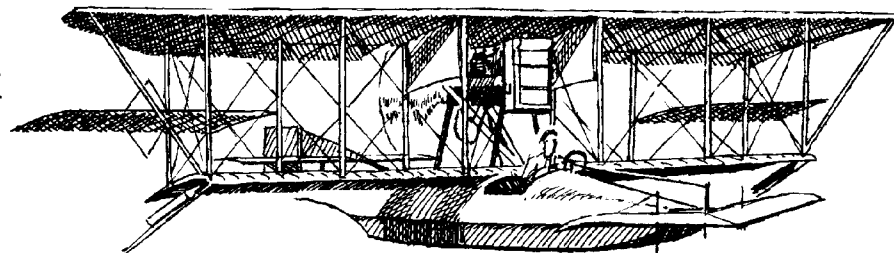
SECOND GLENN  
L. MARTIN AIR-  
CRAFT, 1912



FIRST AMPHIBIAN CURTISS; 1911

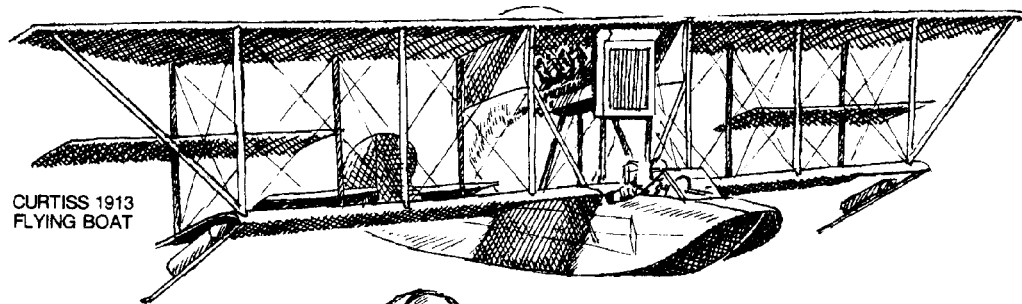
IN 1911, CURTISS BUILT AN AIRCRAFT THAT HAD  
BOTH FLOTATION GEAR AND WHEELS. THIS WAS  
ONE OF THE FIRST AMPHIBIAN AIRCRAFT.

THE CURTISS HYDRO-AEROPLANE (AN AM-  
PHIBIAN) WON THE ROBERT J. COLLIER TRO-  
PHY FOR 1911, AND CURTISS' FLYING BOAT  
WON IT FOR 1912.



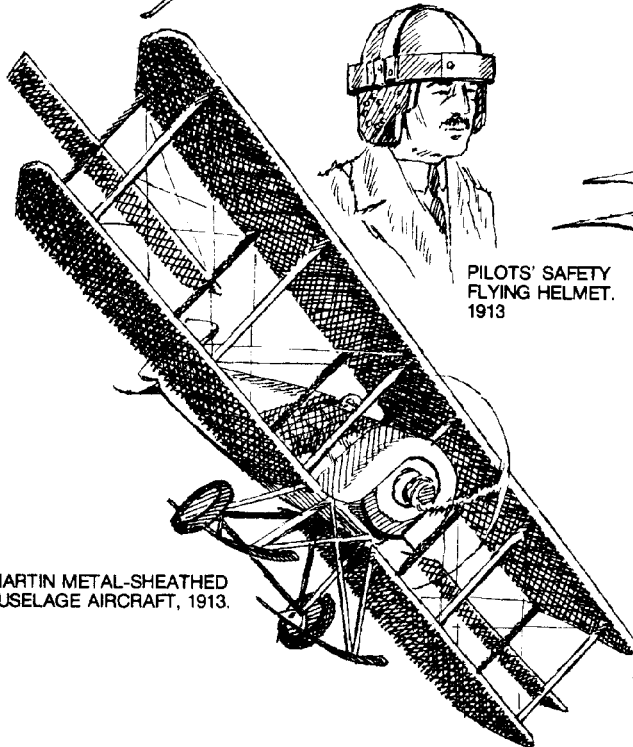
CURTISS FLYING BOAT, 1912





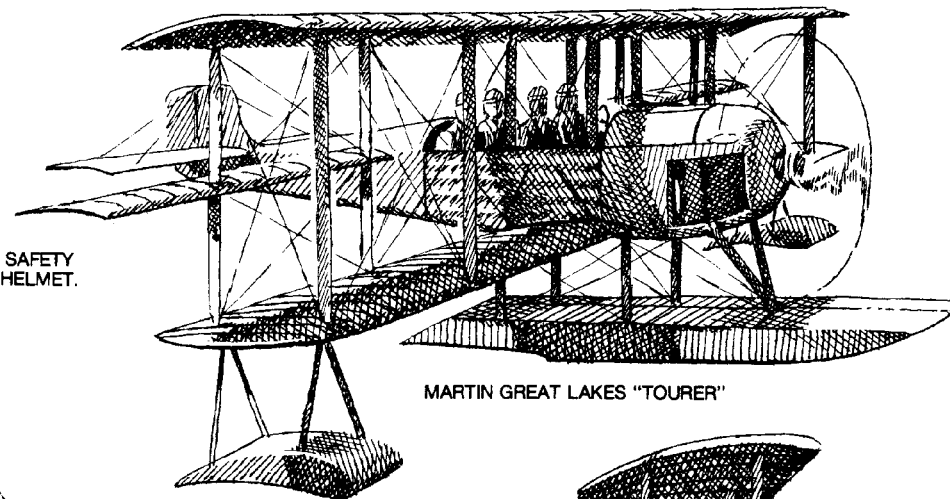
CURTISS 1913  
FLYING BOAT

THE REFINEMENT OF FLYING BOATS WAS FAIRLY RAPID. IN JUST ONE YEAR THE CURTISS COMPANY HAD IMPROVED ITS FLYING BOAT DESIGN AND THE MARTIN COMPANY HAD DEVELOPED AND INTRODUCED THE GREAT LAKES "TOURER."

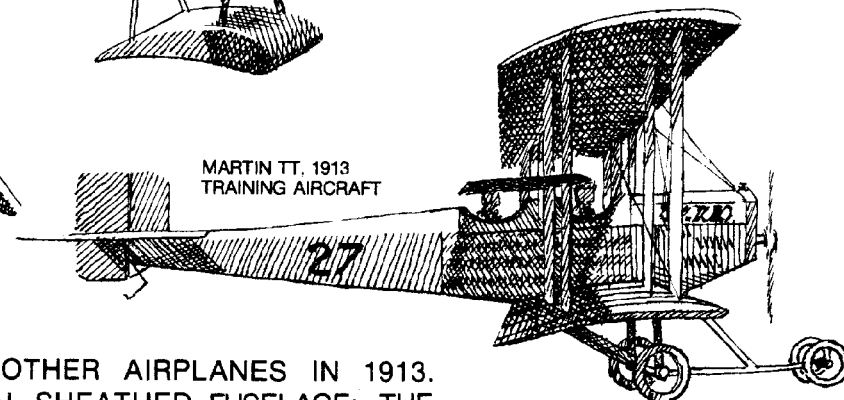


PILOTS' SAFETY  
FLYING HELMET.  
1913

MARTIN METAL-SHEATHED  
FUSELAGE AIRCRAFT, 1913.



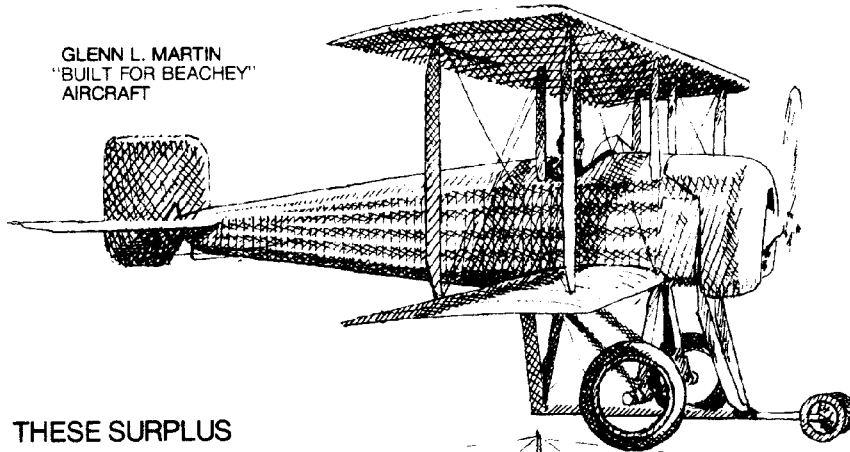
MARTIN GREAT LAKES "TOURER"



MARTIN TT, 1913  
TRAINING AIRCRAFT

THE MARTIN COMPANY INTRODUCED TWO OTHER AIRPLANES IN 1913. BOTH WERE BIPLANES. ONE HAD A METAL-SHEATHED FUSELAGE; THE OTHER REPORTEDLY WAS THE FIRST SAFE TRAINING PLANE.

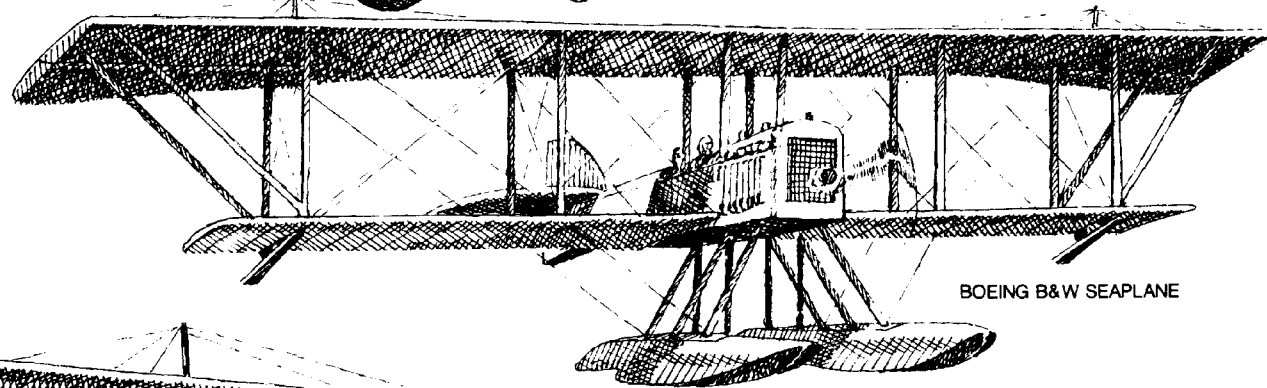
GLENN L. MARTIN  
"BUILT FOR BEACHEY"  
AIRCRAFT



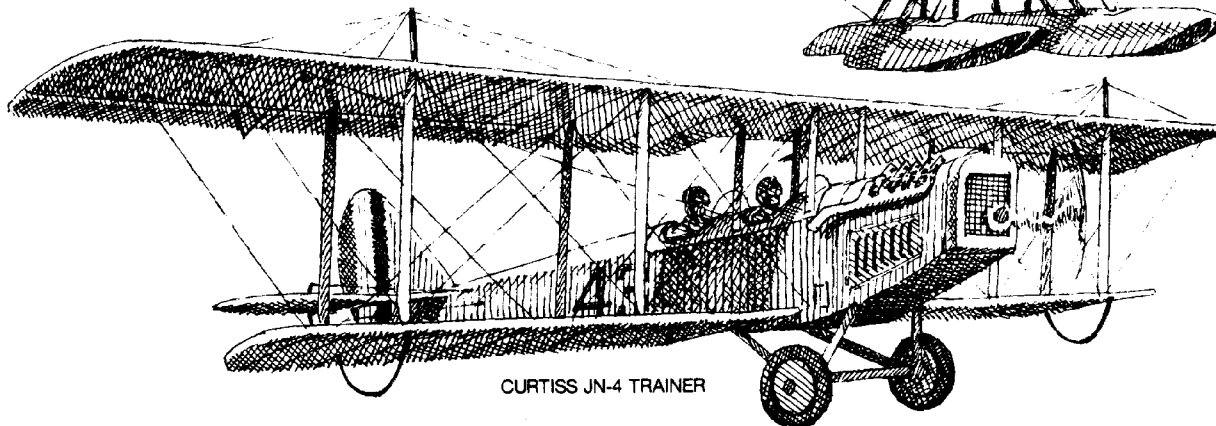
THESE SURPLUS  
AIRCRAFT WERE  
INEXPENSIVE TO  
PURCHASE AND  
THEY MET THE  
DEMAND FOR  
GENERAL AVIA-  
TION AIRCRAFT.

WHEN WORLD WAR I STARTED, UNITED STATES MANUFACTURERS WERE BUILDING ONLY A FEW SPECIAL AIRCRAFT, SUCH AS THE "BUILT FOR BEACHEY" AND THE BOEING B&W SEAPLANE, FOR SPECIFIC PURPOSES.

THE CURTISS JN-4 TRAINING PLANE AND THE BRITISH DESIGNED DH-4, WHICH WAS MANUFACTURED IN THE U.S., BECAME IMPORTANT TO GENERAL AVIATION WHEN THE WAR WAS OVER.



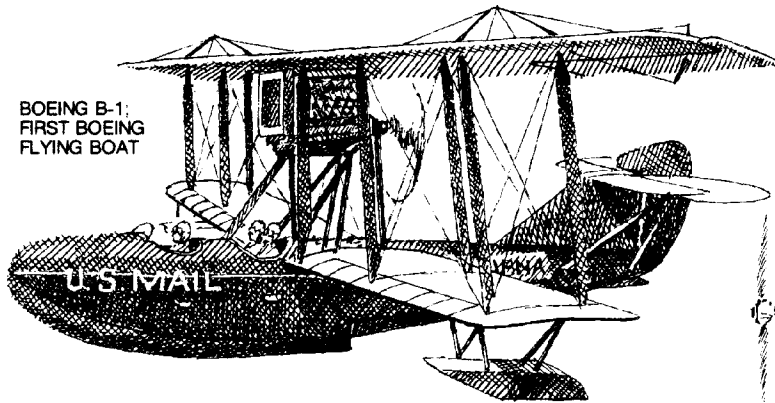
BOEING B&W SEAPLANE



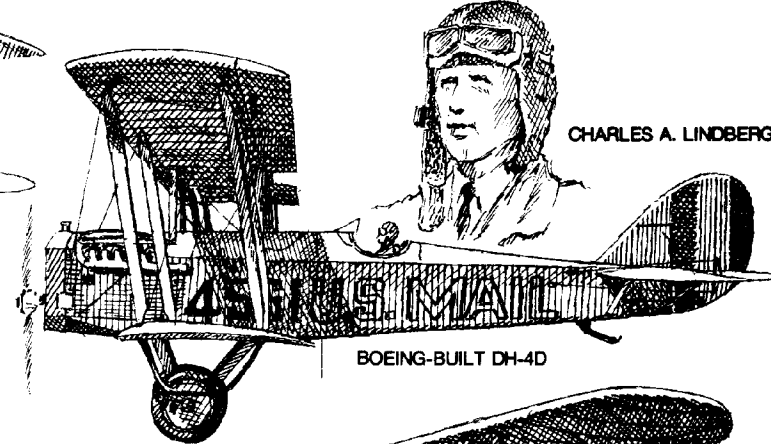
CURTISS JN-4 TRAINER

BECAUSE OF THE AVAILABILITY OF THESE SURPLUS AIRCRAFT, FEW NEW TYPES OF GENERAL AVIATION AIRCRAFT WERE DEVELOPED.

BOEING B-1;  
FIRST BOEING  
FLYING BOAT

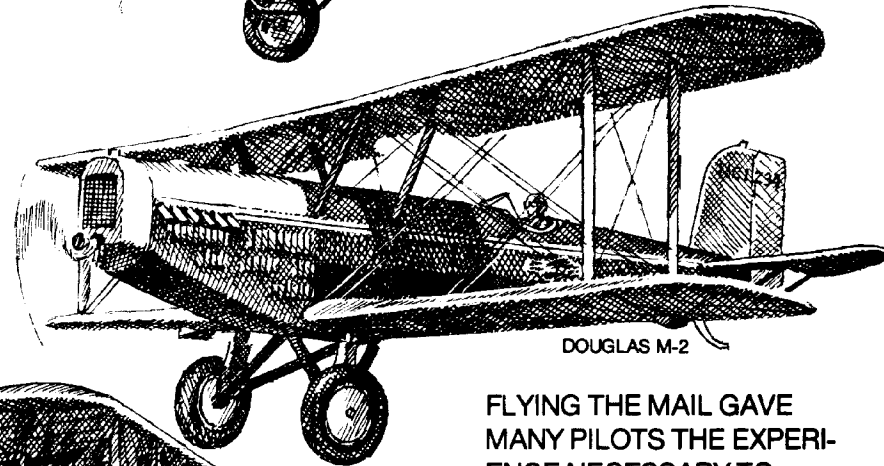


CHARLES A. LINDBERGH



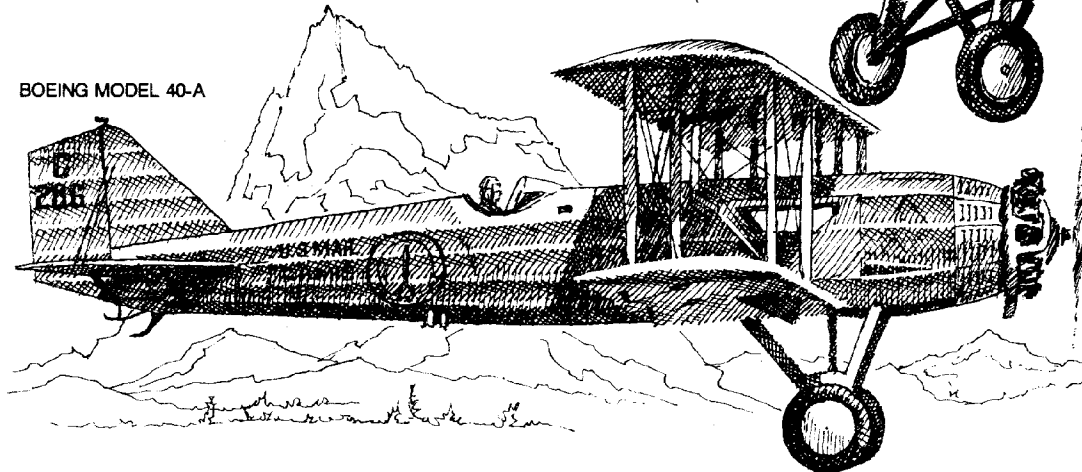
BOEING-BUILT DH-4D

AIRMAIL SERVICE IN THE UNITED STATES BEGAN IN 1918 WITH ARMY AVIATORS FLYING THE MAIL. AIRMAIL SERVICE SOON BECAME THE RESPONSIBILITY OF THE POST OFFICE DEPARTMENT, WHICH LATER USED CONTRACT OPERATORS. THIS LED TO THE DESIGN AND CONSTRUCTION OF SEVERAL NEW "AIRMAIL AIRPLANES," SUCH AS THE DOUGLAS M-2 AND THE BOEING MODEL 40-A.

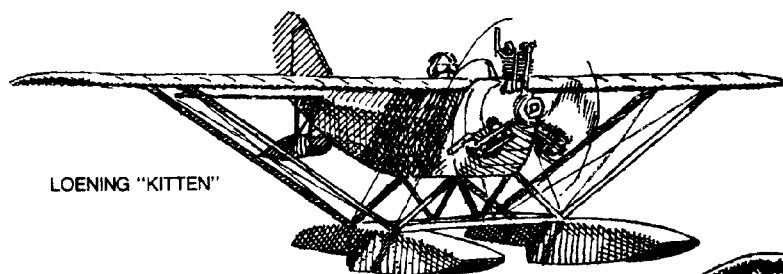


DOUGLAS M-2

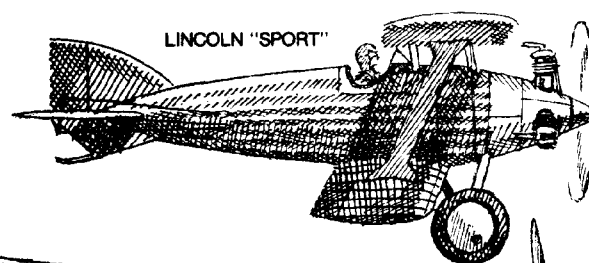
BOEING MODEL 40-A



FLYING THE MAIL GAVE MANY PILOTS THE EXPERIENCE NECESSARY TO BECOME OUTSTANDING AVIATORS. CHARLES LINDBERGH WAS ONE WHO PERFECTED HIS SKILLS WHILE FLYING AS AN AIRMAIL PILOT.

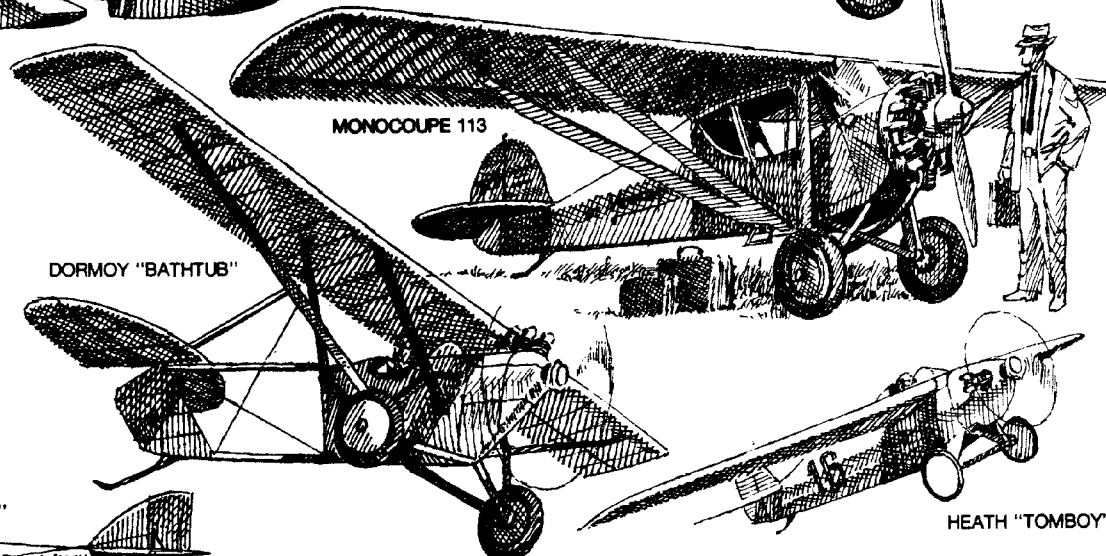


LOENING "KITTEN"

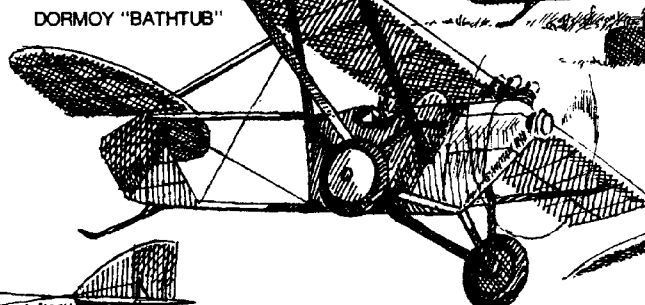


LINCOLN "SPORT"

SEVERAL MAKES OF ULTRA SMALL, ULTRA LIGHTWEIGHT AIRPLANES WERE AVAILABLE TO GENERAL AVIATION IN THE 1920'S. THESE WERE SINGLE-PLACE AND INTENDED FOR THE PILOT WHO WANTED TO FLY JUST FOR THE FUN OF IT, WITH AS LITTLE EXPENSE AS POSSIBLE.



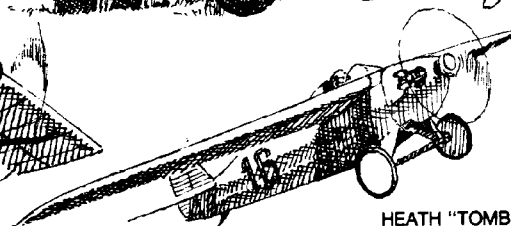
MONOCOUPÉ 113



DORMOY "BATHTUB"



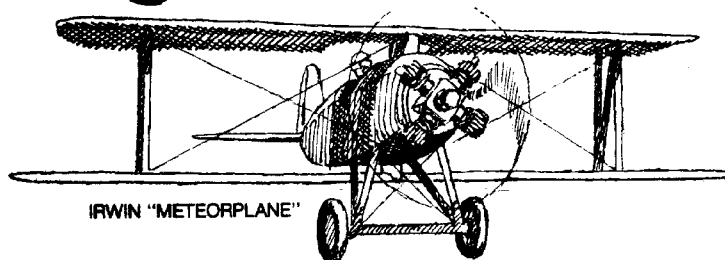
DRIGGS "DART"



HEATH "TOMBOY"



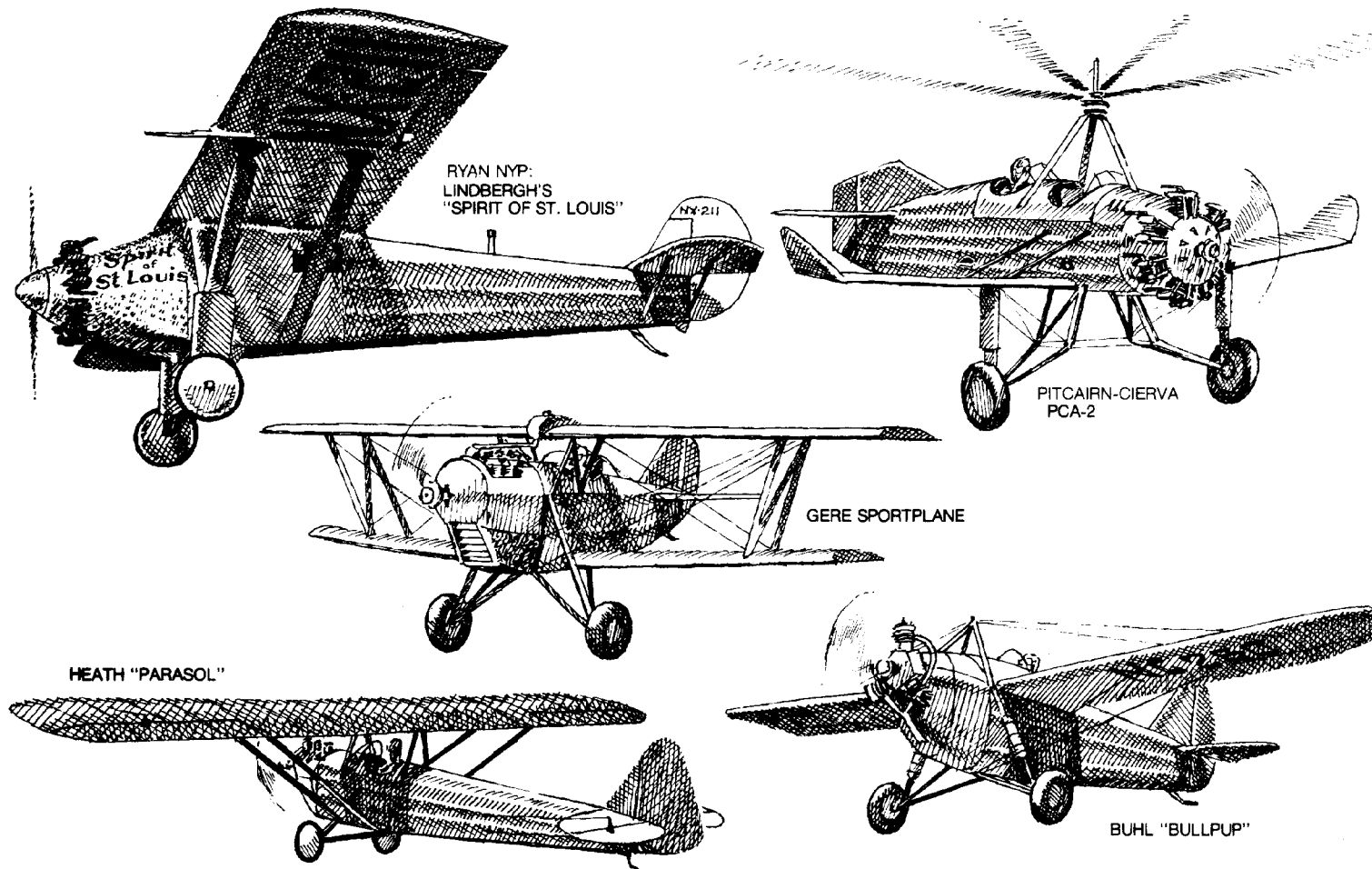
MYERS "MIDGET"



IRWIN "METEORPLANE"

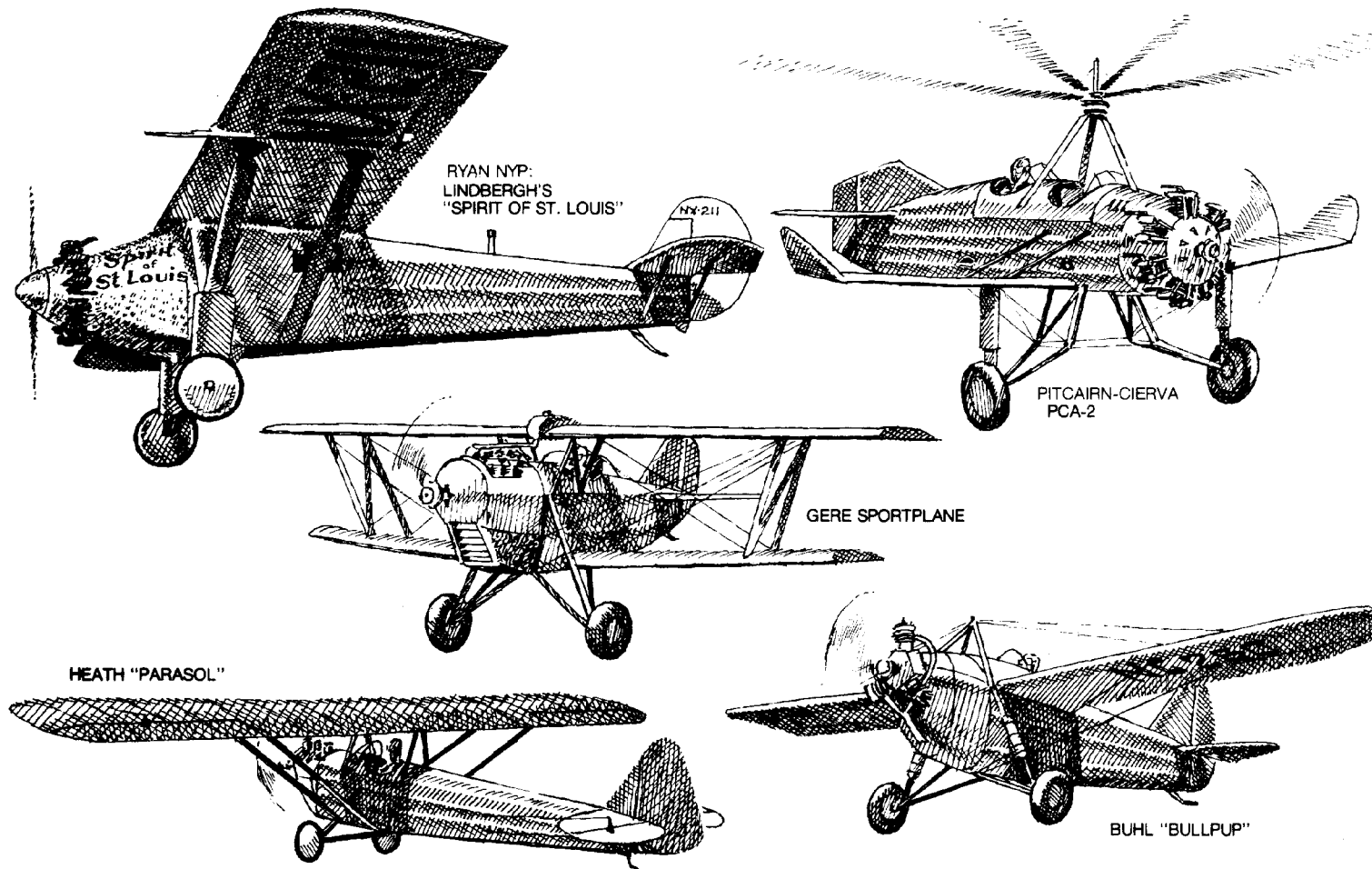
ULTRA SMALL AIRPLANES ARE STILL BEING BUILT TODAY, BUT MOST OF THEM ARE CONSTRUCTED BY INDIVIDUALS FROM KITS OR PLANS.





ALTHOUGH THE AMERICAN PEOPLE WERE EXCITED ABOUT AVIATION, IT TOOK LINDBERGH'S HISTORIC TRANSATLANTIC FLIGHT IN 1927 TO SHOW THE PEACETIME WORTH OF THE AIRPLANE.

IN THE 1930'S, OUR GOVERNMENT HELPED AIRCRAFT MANUFACTURERS RECOVER FROM THE SEVERE ECONOMIC DEPRESSION. THIS FEDERAL ASSISTANCE LED TO MANY NEW DESIGN FEATURES WHICH WERE TO BE USED BY OTHER MANUFACTURERS IN LATER YEARS.

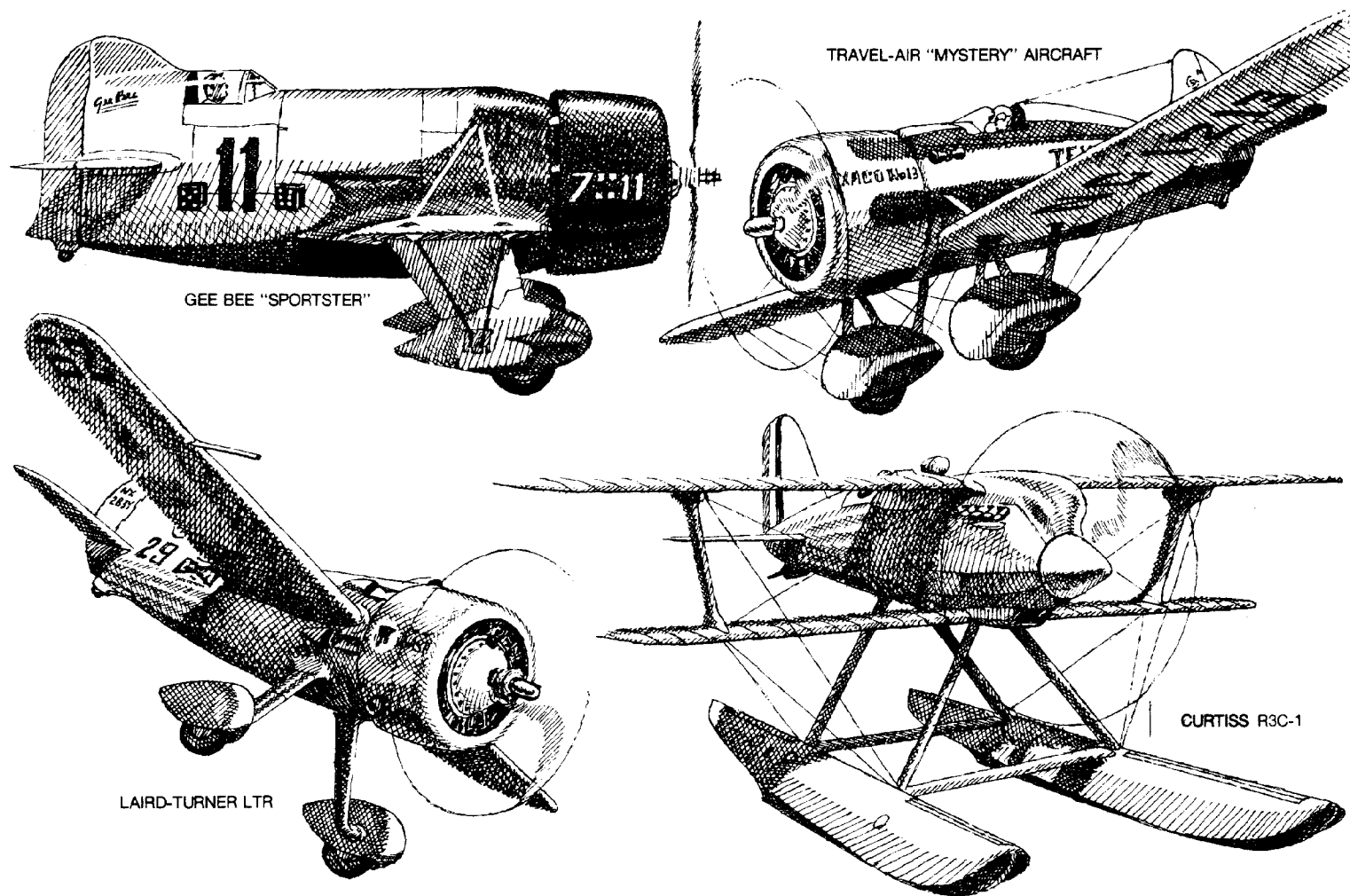


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THE COMPETITION GENERATED BY RACING AIRPLANES HELPED GENERAL AVIATION IN AT LEAST TWO WAYS: IT PRODUCED IMPROVEMENTS IN AIRCRAFT AND IT INCREASED THE PUBLIC'S INTEREST IN AVIATION.

MANY RACING PILOTS, SUCH AS JIMMY DOOLITTLE, BECAME FAMOUS NATIONAL HEROES. ROSCOE TURNER, LOWELL BAYLES, JACKIE COCHRAN, AND A HOST OF OTHERS WERE ALSO FAMOUS RACING PILOTS.

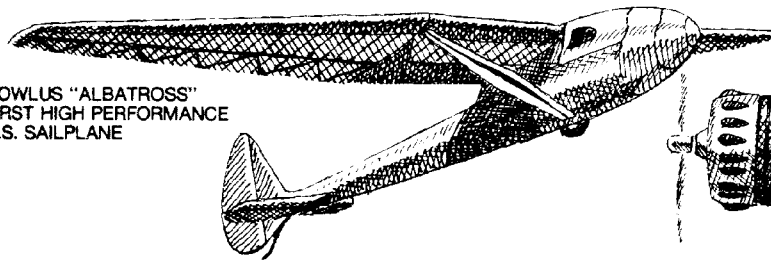




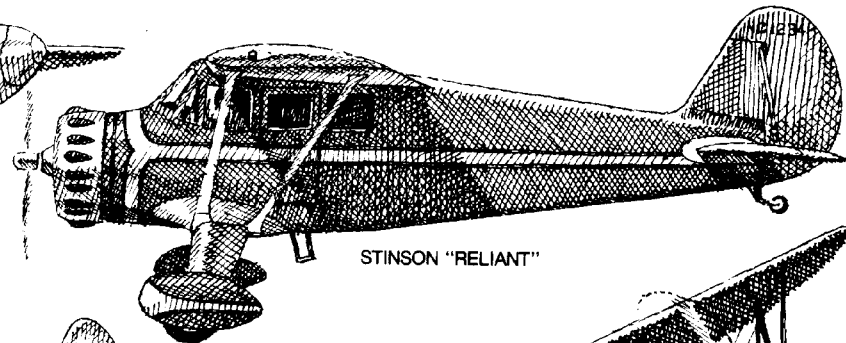
THE 1930'S PRODUCED SOME VERY GOOD PERSONAL-FLYING TYPE AIRCRAFT. SOME OF THESE AIRPLANES ARE CHERISHED TODAY BY THEIR PROUD OWNERS AND ARE KEPT IN FACTORY-NEW CONDITION.

SEVERAL OF THESE SMALL PLANE DESIGNS WERE TO BECOME THE FOUNDATION OF PRIMARY FLIGHT TRAINING FOR FUTURE WORLD WAR II PILOTS.

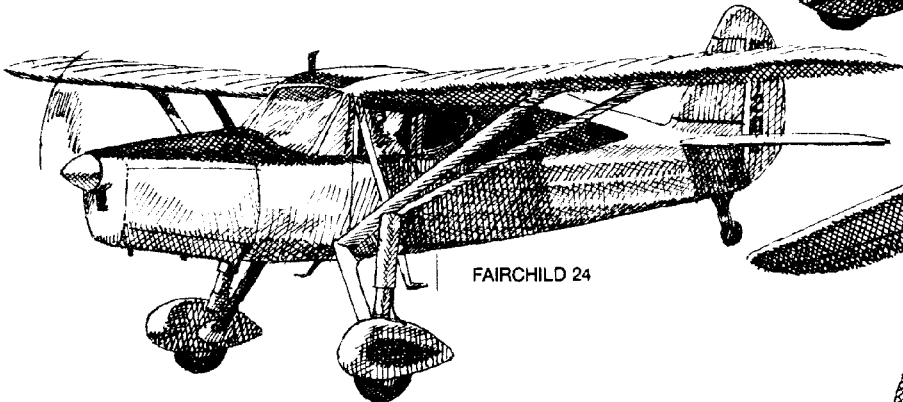
BOWLUS "ALBATROSS"  
FIRST HIGH PERFORMANCE  
U.S. SAILPLANE



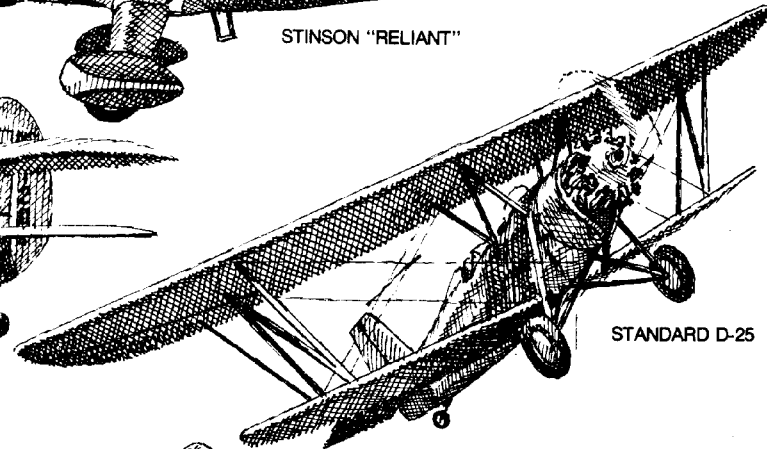
STINSON "RELIANT"



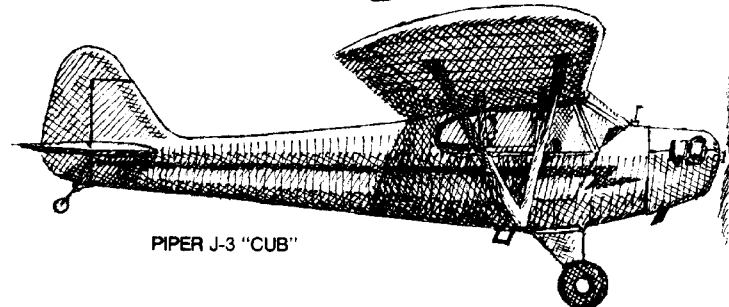
FAIRCHILD 24



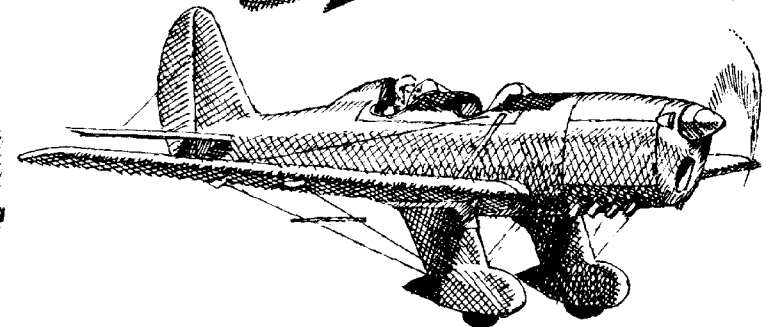
STANDARD D-25

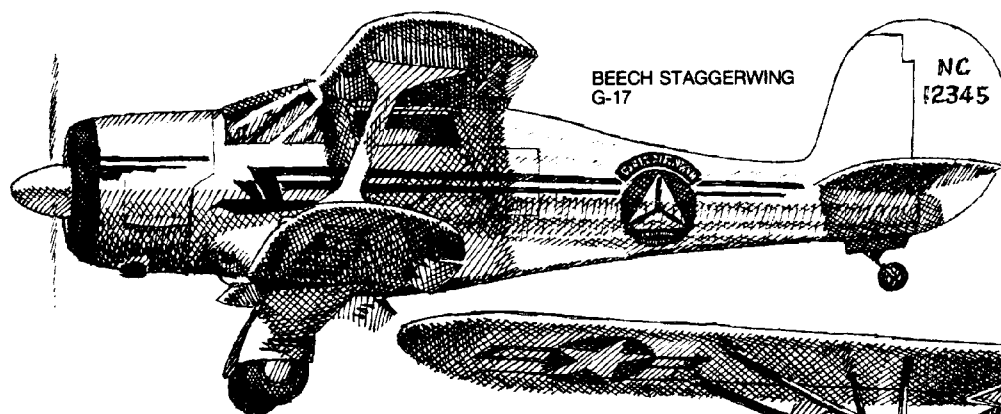


PIPER J-3 "CUB"



RYAN ST SPORT-TRAINER

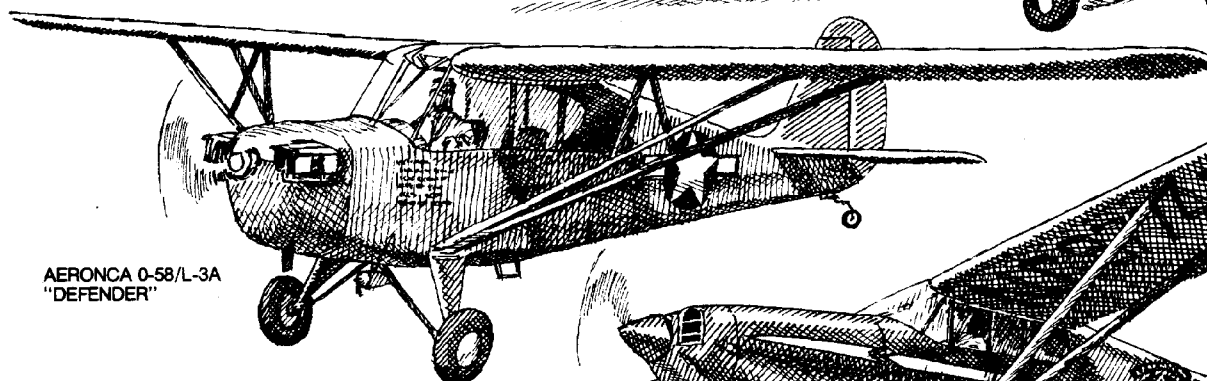
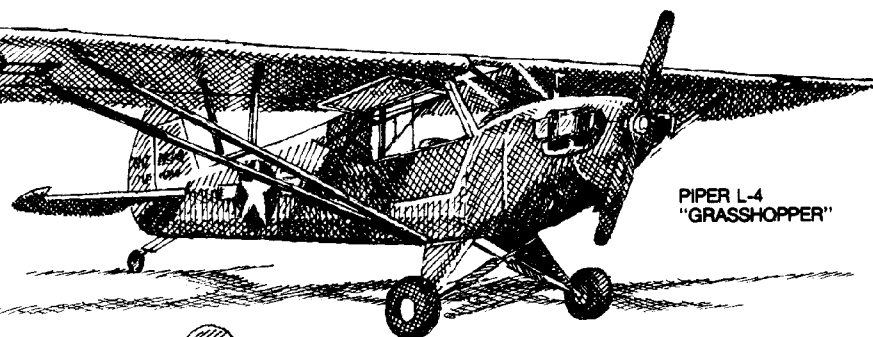




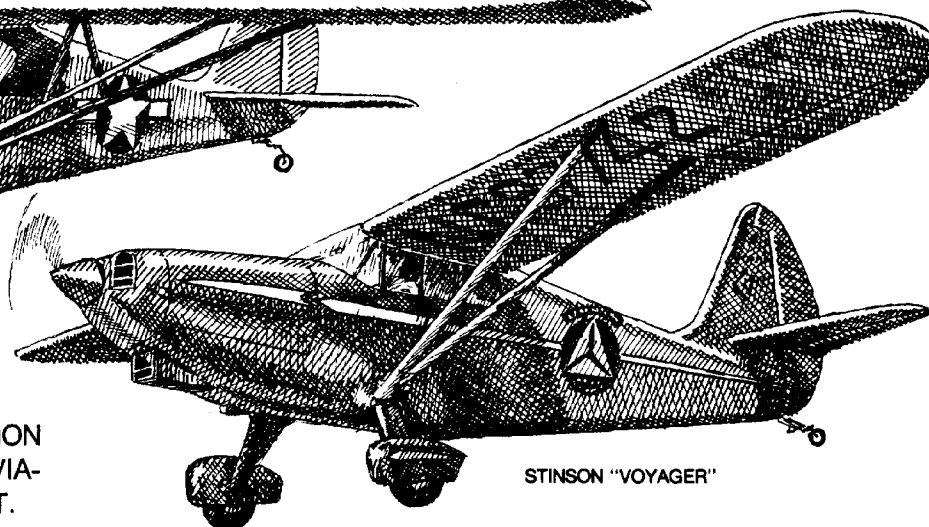
GENERAL AVIATION PROGRESS STOPPED AND FLYING WAS HIGHLY CONTROLLED WHEN THE U.S. ENTERED WORLD WAR II.

FLYING WITH CIVIL AIR PATROL WAS THE ONLY WAY THAT MANY GENERAL AVIATION PILOTS COULD FLY.

NO NEW PRIVATE AIRCRAFT WERE AVAILABLE—ALL AIRCRAFT PRODUCTION WAS DIRECTED TO WINNING THE WAR.

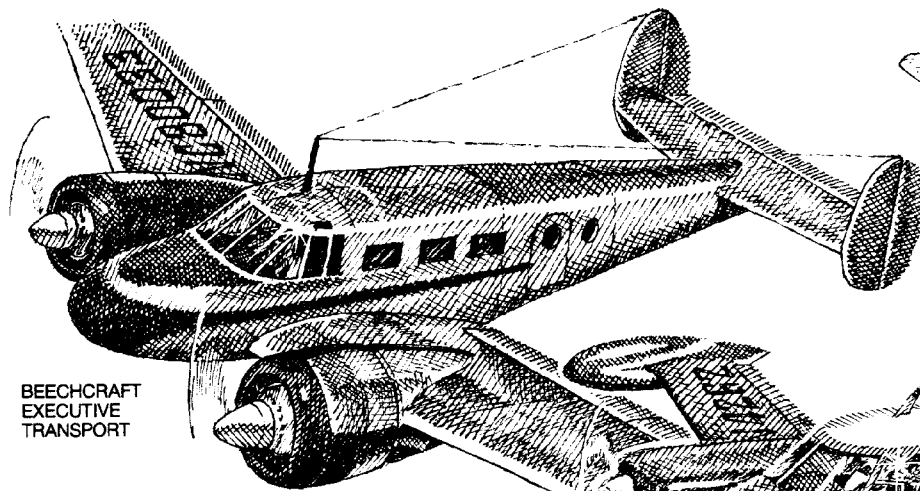


AERONCA O-58/L-3A  
"DEFENDER"

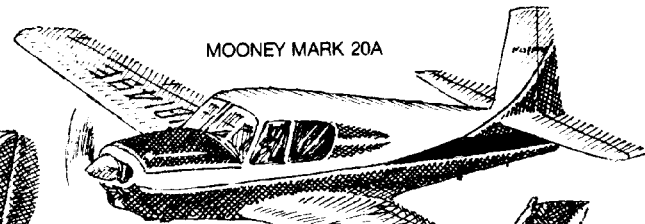


STINSON "VOYAGER"

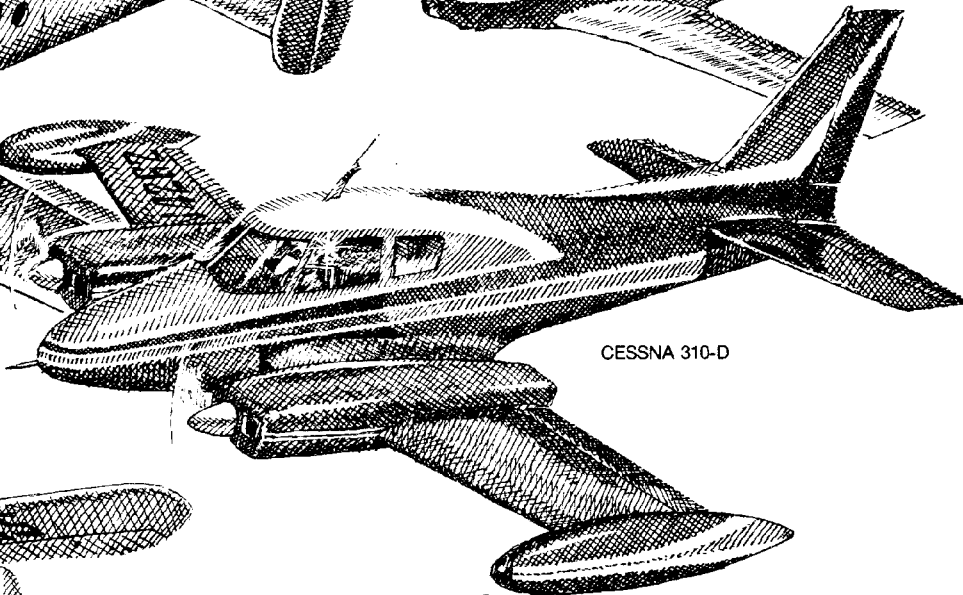
SEVERAL MODELS OF GENERAL AVIATION AIRCRAFT BECAME PART OF MILITARY AVIATION AS TRAINING AND LIAISON AIRCRAFT.



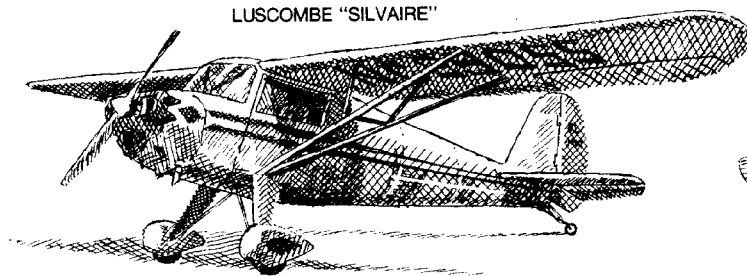
BEECHCRAFT  
EXECUTIVE  
TRANSPORT



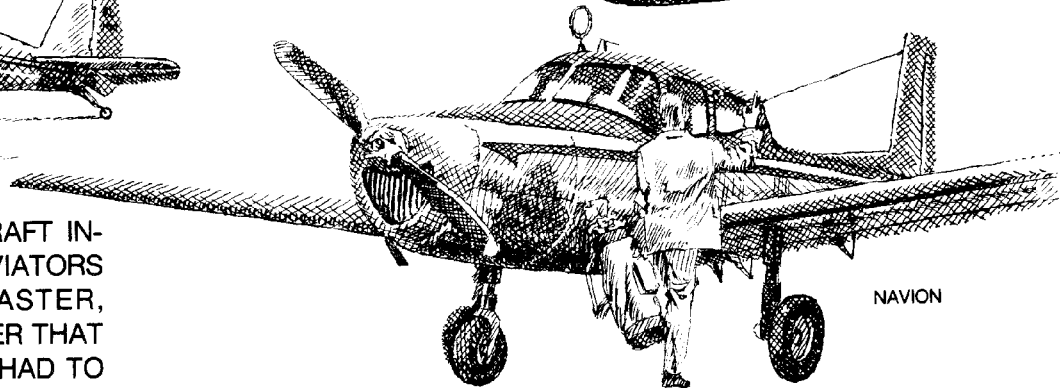
MOONEY MARK 20A



CESSNA 310-D



LUSCOMBE "SILVAIRE"



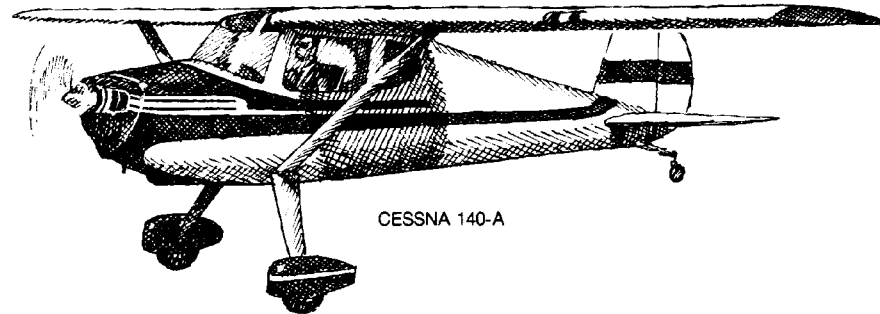
NAVION

IN THE 1950'S AND 1960'S THE AIRCRAFT MANUFACTURERS PRODUCED IMPROVED, ALL-METAL AIRCRAFT.

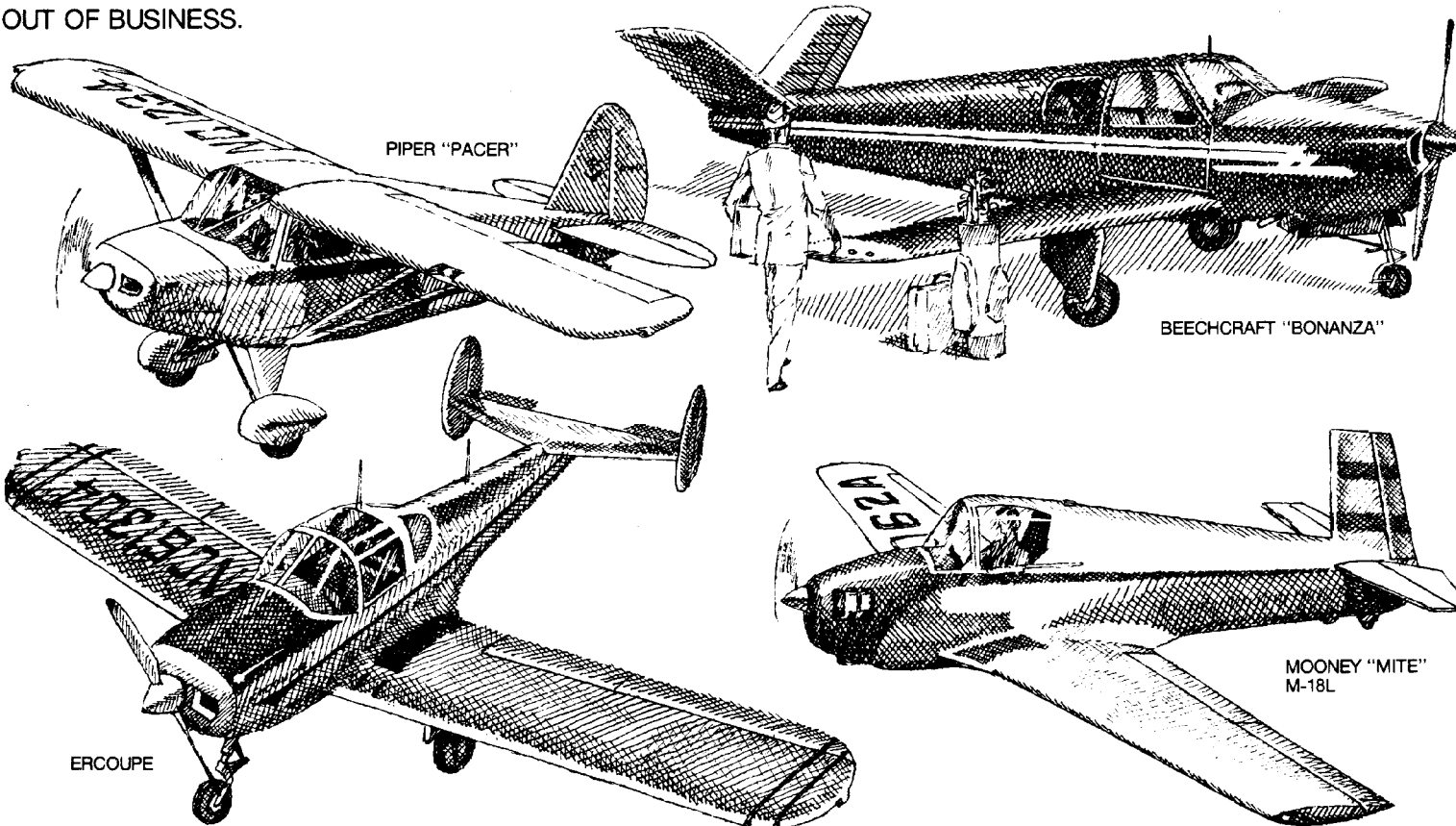
THE DEMAND FOR BETTER AIRCRAFT INCREASED AS MORE SKILLED AVIATORS WANTED TO FLY HIGHER, FASTER, FARTHER, AND THROUGH WEATHER THAT LESS WELL-EQUIPPED AIRCRAFT HAD TO AVOID.

AFTER WORLD WAR II, THERE WERE THOUSANDS OF PILOTS WHO HAD BEEN TRAINED EITHER BY THE MILITARY OR BY THE "G.I. BILL" FOR VETERANS.

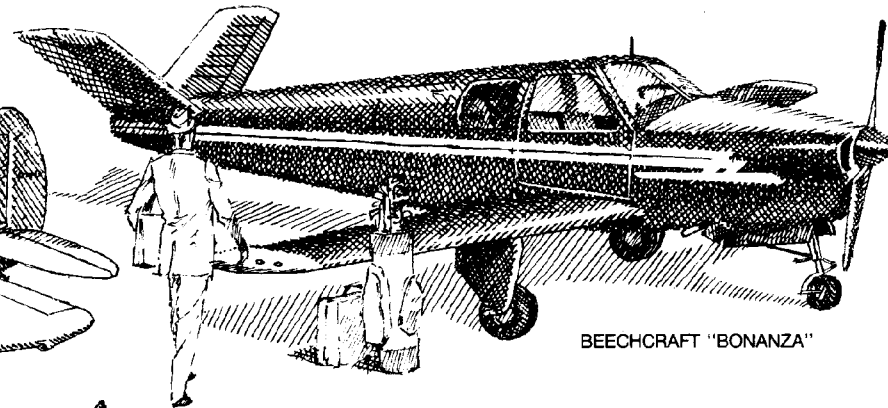
MANY GENERAL AVIATION AIRCRAFT, SOME STILL POPULAR TODAY, WERE BUILT FOR THIS MARKET. HOWEVER, THE POSTWAR AVIATION "BOOM" WAS NOT AS GREAT AS ANTICIPATED AND MANY MANUFACTURERS WERE FORCED OUT OF BUSINESS.



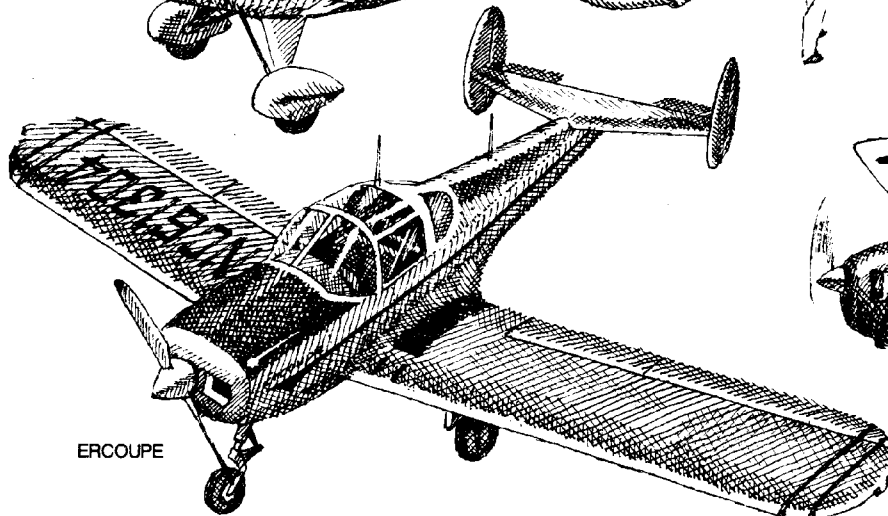
CESSNA 140-A



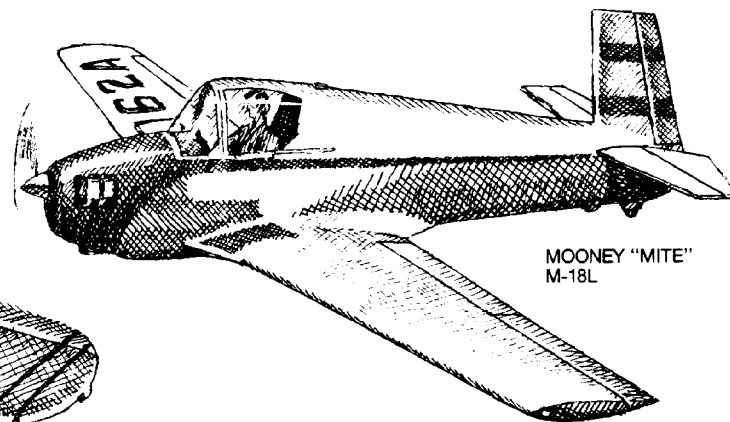
PIPER "PACER"



BEECHCRAFT "BONANZA"

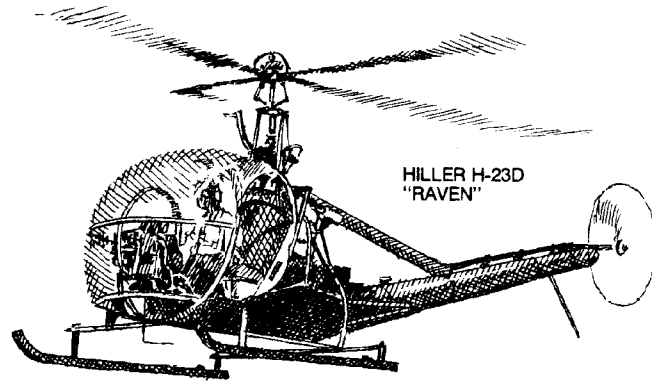


ERCOUPE

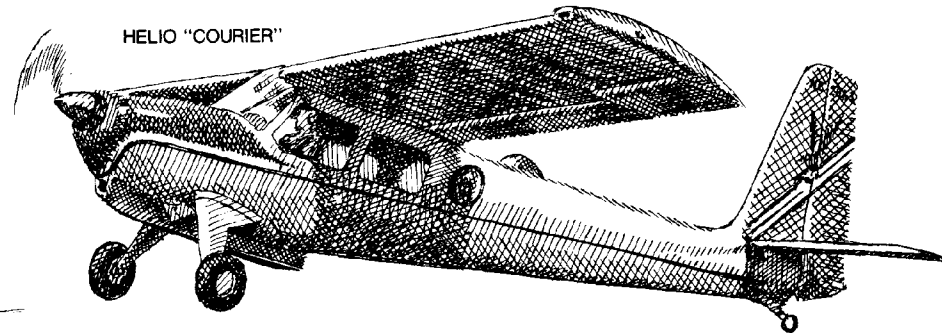


MOONEY "MITE"  
M-18L

SPECIAL PURPOSE AIRCRAFT, SUCH AS AGRICULTURAL TYPES, ALSO BECAME POPULAR. THESE AIRPLANES CAN DO MORE WORK IN MUCH LESS TIME THAN CAN BE DONE BY OTHER METHODS.



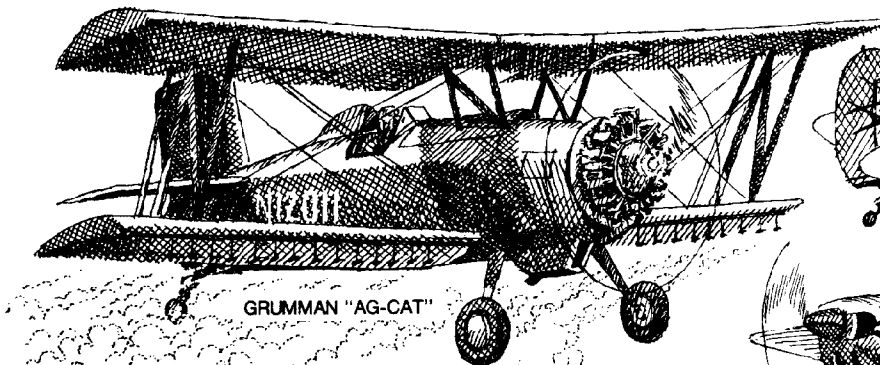
HILLER H-23D  
"RAVEN"



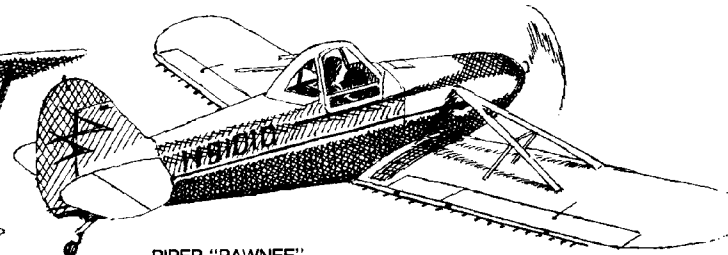
HELIO "COURIER"

IN CERTAIN CASES, HELICOPTERS CAN DO AN EVEN BETTER JOB THAN FIXED-WING AIRPLANES.

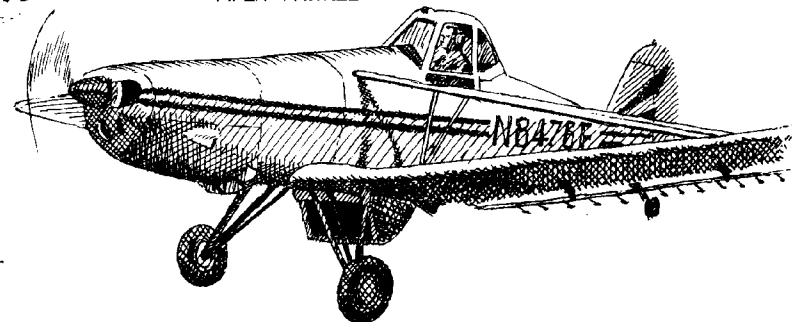
ANOTHER SPECIAL AIRCRAFT IS THE SHORT TAKE OFF AND LANDING (STOL) AIRCRAFT SUCH AS THE HELIO "COURIER" WHICH CAN OPERATE FROM MUCH SMALLER AIRPORTS THAN ORDINARY AIRPLANES.



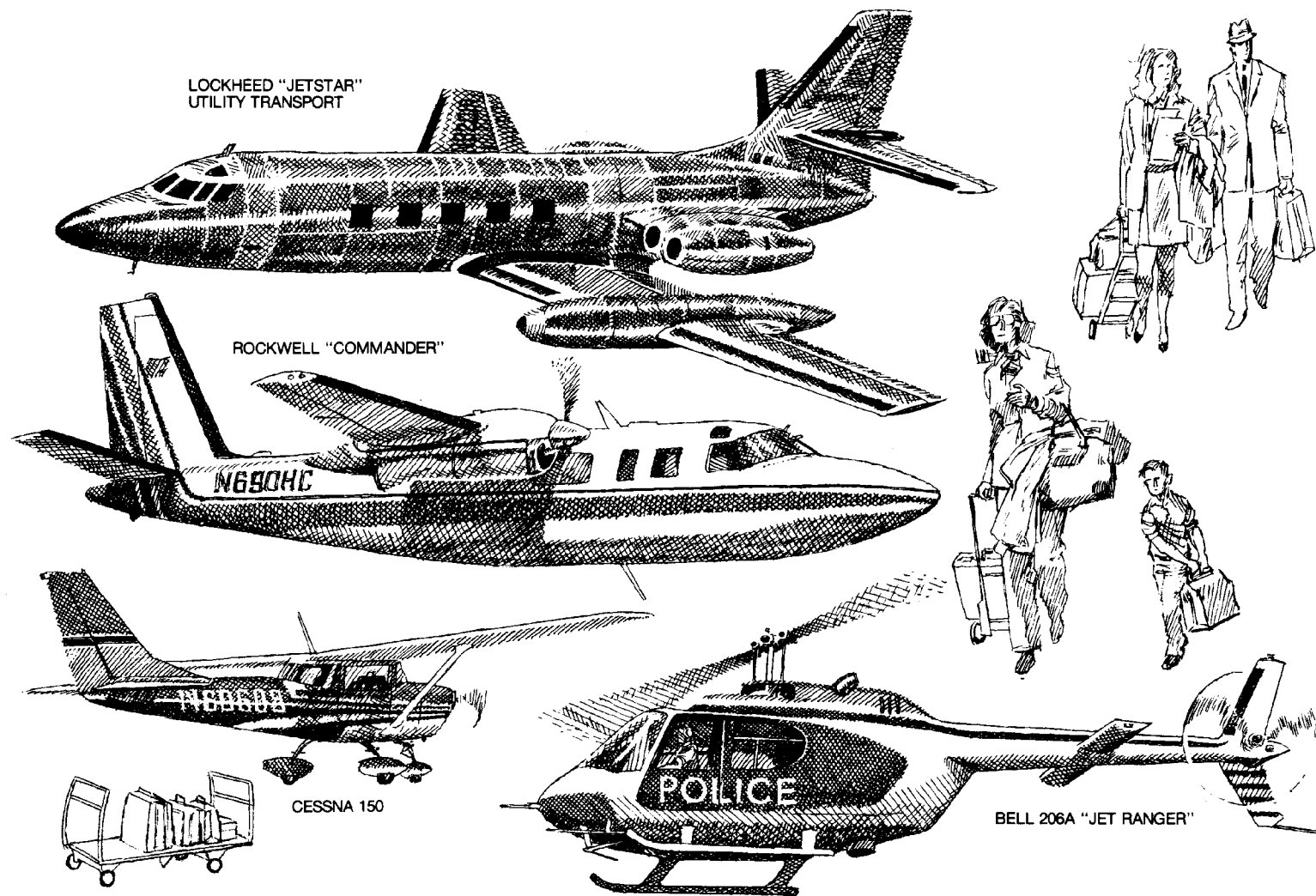
GRUMMAN "AG-CAT"



PIPER "PAWNEE"



NB4781



MODERN GENERAL AVIATION AIRCRAFT HAVE THE SAME BASIC PARTS AS THE OLDER MODELS, BUT THEY ARE MORE COMPLEX AND MORE EFFICIENT.

EACH TYPE OF AIRCRAFT IS SPECIALIZED FOR A PARTICULAR JOB WHETHER IT BE PLEASURE FLYING, BUSINESS AVIATION, COMMUTER AND AIR TAXI OPERATION, CONSTRUCTION, AGRICULTURE, OR LAW ENFORCEMENT.

# AEROSPACE EDUCATION ACHIEVEMENT AWARD



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has successfully completed

**THE AEROSPACE EDUCATION LEARNING PACKET  
ON GENERAL AVIATION**

Given this \_\_\_\_\_ day of \_\_\_\_\_ 19 \_\_\_\_\_

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Teacher



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Principal